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REVIEW
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C. A. B.
1 SEP 1955

ITÔ (K.) & KOBAYASHI (T.). **Contributions to the diseases of Poplars in Japan II. The Cercospora leaf spot of Poplars with special reference to the life-history of the causal fungus.**—*Bull. Govt For. Exp. Sta.*, 59, pp. 1–28, 4 pl. (1 col.), 4 figs., 1953. [Japanese summary.]

A leaf spot of poplar caused by a species of *Cercospora* (probably *C. populina*) [cf. *R.A.M.*, 16, p. 5] was collected at Meguro, Tokyo, in 1948. In 1950 several species of poplar were severely defoliated by the disease. The name *Mycosphaerella togashiana* sp. nov. is proposed for the perfect stage of the *Cercospora*.

Lesions occur only on the foliage, chiefly on lower old leaves, and consist of small, thin, brown, necrotic areas. In Tokyo the leaf spot first appears in July, and by the beginning of August the poplars are almost defoliated. The conidial stage may be found throughout the summer and early autumn, both old and new lesions producing curved multiseptate spores copiously. By October the sub-epidermal stromata on fallen leaves contain spermagonia, which discharge spermatia throughout the winter and spring. The latter are rod-shaped, 2 to 3 by 0·5 to 0·8 μ in size, and all attempts to germinate them have failed. Later, perithecia are formed, singly or in groups, partially erumpent, globose, slightly papillate, and measure 71 to 99 by 62 to 96 μ. The clavate-cylindric, short-stipitate asci measure 31 to 43 by 6 to 8 μ, and contain 8 ascospores which are hyaline, unequally 2-celled, and 12 to 17 by 2·5 to 4 μ in size. The ascospores mature in the summer, and constitute the principal means of primary infection.

The fungus has been isolated in pure culture from both conidia and ascospores, and its growth on various media investigated. In inoculation experiments on five species of *Populus*, *P. simonii*, *P. maximowiczii*, *P. nigra*, and *P. monilifera* were found to be susceptible, while *P. alba* was relatively resistant. The disease seems to be of increasing importance in forests and nurseries in Japan.

PHILLIPS (A. M.), COLE (J. R.), & LARGE (J. R.). **Insects and diseases of the Pecan in Florida.**—*Bull. Fla agric. Exp. Sta.* 499, 76 pp., 54 figs., 1952. [Received January, 1955.]

This is a revision of Bulletin 411 [cf. *R.A.M.*, 19, p. 571] bringing up to date the available information concerning the symptoms and control of pecan diseases in Florida [33, p. 269].

ROLDAN (E. F.) & ANDRES (P. P.). **Bacterial wilt of Teak seedlings (Tectona grandis Linn.).**—*Philipp. J. For.*, 9 (*1953*), 1–4, pp. 133–142, 2 pl., 1954.

A bacterial wilt of teak (*Tectona grandis*) seedlings provisionally attributed to *Pseudomonas tectonae* n.sp. was first observed in 1948 in the nursery of the Magat Reforestation Project, Bagabag, Nueva Vizcaya, Philippines, and in 1949 it threatened to disrupt the entire project. Initial symptoms were gradual loss of turgor or sudden acute wilting early in the day, particularly during clear, hot, sunny

weather. The condition eased towards evening but became more pronounced on each successive day until the plants collapsed and died. The bacterium was found in the xylem vessels of the roots and also those of the stem in advanced cases. Pathogenicity was established by inoculation of healthy seedlings and reisolation.

The bacterium, a moderately motile rod measuring 1·65 to 4·33 by 0·45 to 1·28 μ, with rounded ends and a single polar flagellum, is non-spore-forming, slightly capsulate, aerobic, Gram-negative, and non-acid-fast. It forms gas and acid in sucrose, dextrose, and maltose. The thermal death point lies between 52° and 53° C. and the optimum temperature for development between 25° and 30°.

Control consists in destroying diseased or suspected plants, avoiding root injuries, and planting infested soil continuously used for teak seedlings with a resistant species for some time or, in urgent cases, setting out a new nursery on unbroken forest soil and avoiding the introduction of contaminated soil.

MEJIA (A. S.). **Sclerotium wilt of Supa (Sindora supa Merr.).**—*Philipp. J. For.*, 9 (*1953*), 1–4, pp. 119–129, 2 pl., 1954.

During July and August, 1951, in unusually warm, wet weather, supa seedlings (*Sindora supa*) in seed beds in the Makiling National Park, College, Laguna, Philippines, were suddenly and severely attacked by a wilt attributed to *Sclerotium rolfsii*, a new host record. Seedlings infected on emergence immediately ceased growing and the cotyledons lost their natural colour and stiffness. The base of the stem above soil level was markedly discoloured and constricted and later developed white mycelial tufts and finally sclerotia. When attacked at a later stage, the whole seedling drooped, the leaves withered and fell, and the typical mycelial and sclerotial formation was observed. Seedlings attaining a height of 12 in. or more were seldom attacked.

Mycelial inoculation experiments demonstrated the pathogenicity of the fungus to supa and to various other important forest trees not previously known to be susceptible, including *Vitex parviflora*, *Cananga odorata*, *Spathodea campanulata*, *Pterocarpus indicus*, *Casuarina equisetifolia*, *Barringtonia asiatica*, *Terminalia catappa*, *Swietenia mahogani*, *Berria cordifolia*, and *Cassia fistula*.

Damage may be reduced by proper soil tillage and drainage, sowing during the drier part of the year, and avoiding heavy watering. Susceptible hosts should not be planted in infected beds for some time.

BAKSHI (B. K.). **Wilt disease of Shisham (Dalbergia sissoo Roxb.). II. Behaviour of Fusarium solani, the wilt organism, in soil.**—*Indian For.*, 81, 4, pp. 276–281, 1955.

In further studies on the wilt of *Dalbergia sissoo* (*Fusarium solani*) [*R.A.M.*, 33, p. 569] at the Forest Research Institute, Dehra Dun, India, the pathogen was shown to be widely distributed in local soils bearing both healthy and wilted trees, and also in the absence of the host. *F. solani* was able to grow saprophytically on dead *D. sissoo* roots and in soil, so control by crop rotation is not feasible.

ANDREWS (S. R.). **Red rot of Ponderosa Pine.**—*Agric. Monogr. U.S. Dep. Agric.* 23, 34 pp., 14 figs., 1 diag., 6 graphs, 1955.

An expanded account is given of red rot (*Polyporus anceps*) of *Pinus ponderosa* in the United States [*R.A.M.*, 33, p. 456]. Branches larger than 1·5 ins. in diameter are five to 20 times more susceptible to infection than smaller ones. The fungus can penetrate to the heartwood through the resin-filled wood of the knots; 60 to 80 per cent. of the heartwood infections, however, occur through the pith cavities. Heart rot is usually negligible in 41- to 100-year-old stands. Infected trees may be expected to have columns of heart rot 9 ft. long at 100 years and 15 ft. at 150 years. The maximum protection against *P. anceps* is obtained by pruning young

trees at frequent intervals to clear the trunks to 17 ft. [The author deals more briefly with the red rot problem in *Sta. Pap. U.S. Dep. Agric. For. Serv.* 15, 11 pp., 5 figs., 4 graphs, 1954. Mimeographed.]

BUDDENHAGEN (I. W.). **Phytophthora cinnamomi (Rands) bij Chamaecyparis lawsoniana (Parl.) en Taxus baccata (L.) in Nederland.** [*Phytophthora cinnamomi* (Rands) on *Chamaecyparis lawsoniana* (Parl.) and *Taxus baccata* (L.). in Holland.]—Abs. in *Tijdschr. PlZiekt.*, 61, 1, pp. 17–18, 1955.

In 1954 *Chamaecyparis lawsoniana* was found to be attacked by *Phytophthora cinnamomi* for the first time in Holland [C.M.I. map No. 302]. Infection originates in the root system and thence spreads to the base of the stem, where a sharp line of demarcation is visible between the healthy and diseased tissue. The leaves turn pale and shrivel. In cool weather the root system may collapse entirely before the foliar symptoms appear. In yew the dividing line between healthy and diseased tissue is less sharp than in *C. lawsoniana* and the root system is only partially involved.

P. cinnamomi has been isolated from vars. *alumi* and *columnaris* of *C. lawsoniana* by first inoculating into apple and then transferring to agar from lesions on the fruits; identical symptoms were observed on vars. *wisseli*, *lombartii*, and *glauca*. *P. cinnamomi* may be distinguished from other *P.* spp. by the development on the hyphae of numerous round swellings, 20 to 40 μ in diameter. It grows over a temperature range from 8° to 31° C. Infection may be initiated by zoospores formed at soil temperatures of 20° and upwards, which are occasionally reached in Holland, so that infection by this means is not excluded.

A disease of *C. lawsoniana* with symptoms exactly the same as the foregoing is caused in Oregon by *P. lateralis* [*R.A.M.*, 34, p. 4]. However, *P. cinnamomi* numbers over 55 plants and trees among its hosts, whereas *P. lateralis* is specialized on *C. lawsoniana*.

MAŃKA (K.). **Badania terenowe i laboratoryjne nad opieńką miodową Armillaria mellea (Vahl) Quél.** [Field and laboratory investigations on the honey fungus *Armillaria mellea* (Vahl) Quél.]—*Prace Inst. Badawczy Lesn.* [*Stud. Inst. For. Res.*] 94, 96 pp., 20 figs., 8 graphs, 1953. [Russian and English summaries.]

Investigations on the honey fungus (*Armillaria mellea*) on spruce [cf. *R.A.M.*, 25, p. 482] at the State Forestry, Andrychów, Poland, indicate that the disease, chronic or occasionally acute, has been present in stands of all ages for the last 20 years but apparently reaches its climax in 30-year-old trees. The greatest economic losses occurred in 1947–8. Detailed descriptions are given of the growth in culture of *A. mellea* and 'A. 125', a new honey fungus isolated from the ends of 80 per cent. of the feeding roots of trees of all ages. 'A. 125' developed best on glucose-potato agar. Its growth was more rapid on agar culture media prepared with spruce than with fir root extract; unlike *A. mellea* it did not develop on culture medium prepared from elm twigs. The optimum growth temperature is 25° C. and pH between 4 and 7. The presence of 'A. 125' hastens the rhizomorph development of *A. mellea*, and at lower temperatures this element appears to be indispensable.

BOYCE (J. S.) & WAGG (J. W. B.). **Conk rot of old-growth Douglas-Fir in Western Oregon.**—*Bull. For. Prod. Lab. Ore.* 4, 96 pp., 6 figs., 1 diag., 20 graphs, 1953.

In this investigation, begun in 1948, into conk rot (*Fomes pini*) in old stands of Douglas fir [*Pseudotsuga taxifolia*: *R.A.M.*, 30, p. 499] in western Oregon it was found that losses from decay, of which over 80 per cent. is due to *F. pini*, vary from 5 to 50 per cent. of the total board-foot volume. Most of the remaining decay was due to *Polyporus schweinitzii* [20, p. 552], *F. laricis* [loc. cit.], and *F. roseus* [19,

p. 445]. The effect of *F. pini* is to reduce the rate of growth of the tree, so the relative amount of decay may be deduced by a comparison of the last 20 years' growth rings. Estimates of decay based on the number and position of sporophores on the trunk were accurate to within 5 per cent. in ten out of 14 plots.

The most rapidly growing trees are first infected, their growth is reduced and they finally die; the remaining trees meanwhile become infected and the cycle continues. The number of trees infected by *F. pini* increased with the age of the stand, and decay was greatest on dry, shallow, excessively drained or steeply sloping soil with southerly aspects, where temperatures were highest. Temperature, therefore, may be a controlling factor. Highly nitrogenous soils bore more infected trees than soils with a low nitrogen status, pure stands more than mixed ones, and fire-damaged stands more than undamaged ones.

STEUER. **Eine kleine Imprägnieranlage für Zaunpfähle.** [A small impregnation installation for fence posts.]—*Alleg. Forstz.*, 9, 18–19, pp. 208–209, 6 figs., 1954.

Directions are given for the construction and utilization of a simple installation for the preservation of fence posts with 4 per cent. basilite [*R.A.M.*, 34, p. 198] or other salts of the UA group [which are listed, with the addresses of their manufacturers]. Roughly speaking, the duration of treatment for pine wood posts of 6, 12, and 15 cm. in diameter should be two, three, and four days, respectively, and the corresponding periods for spruce three, four, and five, respectively. It is estimated that the service life of green pine wood may be lengthened from between two and three to eight to 12 years by this method of impregnation.

ZUBIETA (G. J.). **Valoración tóxica comparativa de algunos preservadores de maderas.** [Comparative toxic evaluation of some wood preservatives.]—*Indust. y Quím.*, 16, 5, pp. 305–306, 1954.

The writer has amplified the bibliography to the original paper by himself and collaborators [*R.A.M.*, 33, p. 514] by a further 111 titles.

HENDERSON (M[OIRA] E. K.). **Release of aromatic compounds from Birch and Spruce sawdusts during decomposition by white-rot fungi.**—*Nature, Lond.*, 175, 4458, pp. 634–635, 1 fig., 1955.

At the Macaulay Institute for Soil Research, Craigiebuckler, Aberdeen, an attempt was made to discover whether aromatic compounds are released on the biological decomposition of lignin in birch and spruce sawdusts by the white rot fungi *Polystictus versicolor* and *Trametes* [*Fomes*] *pini* [cf. *R.A.M.*, 29, p. 68]. The fungi grew well, penetrating the sawdust and turning it pale. After six months' incubation at 22° C. a sample was extracted and subjected to paper chromatography. Extracts from both sawdusts, when sprayed with diazotized sulphanilic acid, showed strong orange and red spots for vanillic and syringic acid, respectively, while the uninoculated sawdust gave only faint spots. Vanillic acid alone was released from spruce sawdust by both fungi. These results are of interest as they conform with chemical analyses of lignin which show the occurrence of guaiacyl and syringyl groups in hardwood lignin and of guaiacyl groups alone in softwood lignin.

CRAET (A. A. M.). **Annélation et empoisonnement des arbres en forêt équatoriale.** [Girdling and poisoning of trees in the equatorial forest.]—*Bull. Inform. Inst. Étud. agron. Congo belge*, 2, 5, pp. 309–364, 36 figs., 1 diag., 1953. [Flemish summary.]

The author presents evidence (based on experiments on about 6,000 trees, 300 of which were poisoned) from the Belgian Congo to show that forest trees can be destroyed safely and economically by girdling or poisoning [cf. *R.A.M.*, 29, p. 236;

31, p. 232; 32, p. 276]. The simpler and more economical method is girdling, and this should be adopted if time elapsing before death of the tree is of secondary importance; any trees that prove refractory to this treatment, or which have to be removed quickly, can be poisoned. A preliminary test should always be made, if necessary, to ascertain which species can be killed by girdling. Locally, after either procedure, inspections are made by mycologists to determine the effect on foot rots [unspecified].

McNeil (D.). **Creosote as a wood preservative.**—*Wood*, 19, 10, pp. 411–414, 1954.

The author reviews and discusses the present state of knowledge concerning creosote [*R.A.M.*, 32, p. 51; 34, p. 334] as a wood preservative under the main headings: the chemical compounds present in creosote, the effect of carbonization conditions on its composition, and the wood-preserving efficiency of the substance and its components [32, p. 158; 33, p. 697, *et passim*].

Grindell (P.). **Pressure creosoting.**—*Wood*, 19, 11, pp. 446–448, 7 figs., 1954.

After discussing some of the most important points in the amended, modified British Standard for the preservative treatment of timber by pressure processes recently issued [*R.A.M.*, 32, p. 599], and making suggestions to be considered in a revision, the author expresses the view that the importance of correct preparation of timber before treatment should be recognized. Moisture-content should be corrected, in order that the cell cavities may be able to accept the necessary quantity of preservative. Secondly, pre-manufacture should be carried out where possible. Brush-treatment of exposed surfaces is only a second-best method, and needs very careful supervision if it is to be effective. In many creosoting plants there is a pre-fabrication section where such work is done satisfactorily and pressure treatment carried out at a greatly reduced cost.

Bain (D. C.). **Resistance of Cabbage to black rot. Disappearance of black rot symptoms in Cabbage seedlings.**—*Phytopathology*, 45, 1, pp. 35–37, 55–56, 2 figs., 1955.

In further studies at the Truck Crops Branch Station, Crystal Springs, Mississippi, on varietal resistance to black rot (*Xanthomonas campestris*) in cabbage [*R.A.M.*, 34, p. 199], healthy individuals were selected among seedlings developing from inoculated seed of Huguenot, Early Fuji, and Round Dutch. The resistance of the last-named was broken down in severe inoculation tests but that of the other two varieties was maintained. The progeny of Huguenot × diseased Early Jersey Wakefield and Bonanza remained free from infection under exacting conditions. The results of seed inoculation tests on the F_2 offspring of some of these crosses suggested simple Mendelian inheritance with a single dominant factor controlling resistance to *X. campestris*.

Further experimental evidence is presented for the failure of black rot symptoms to develop in the resistant Wisconsin All Seasons cabbage variety [32, p. 413]. Thus, only 41 per cent. of the plants with diseased cotyledons showed true leaf symptoms and 12 per cent. were killed, while 5 per cent. of those with healthy cotyledons subsequently contracted black rot. The corresponding percentages for the susceptible Copenhagen Market were 89, 21, and 20, respectively. Since the environmental conditions, comprising maintenance in the greenhouse at temperatures above 21° C. with frequent watering, were conducive to the growth of the pathogen, its restricted development in Wisconsin All Seasons is considered to be attributable to varietal resistance.

Botting (G. W.). **Molybdenum deficiency in Brussels Sprouts.**—*J. Dep. Agric. S. Aust.*, 58, 6, pp. 246, 253, 3 figs., 1955.

Molybdenum deficiency seriously affects the production of Brussels sprouts [cf.

R.A.M., 32, p. 600] in the Adelaide Hills, South Australia. Deficient plants are easily distinguished by the interveinal yellowing of the leaves; severely affected plants become stunted and straggly, the older leaves falling prematurely. The few sprouts formed are small and unmarketable. The whiptail symptom found in cauliflowers [34, p. 283] is seldom seen in Brussels sprouts.

An application of 1 oz. of ammonium molybdate or $1\frac{1}{3}$ oz. of sodium molybdate in solution to 10 sq. yds. of seedbed two to three weeks before transplanting provides sufficient molybdenum for the full growing period. Both materials also control cauliflower whiptail. If the seed bed is dry it should be watered immediately after treatment.

NETO (J. P. DA C.). **Ocorrência e forma apotecial de 'Sclerotinia sclerotiorum' (Lib.) Mass. no Estado do Rio Grande do Sul, Brasil.** [Occurrence and apothecial state of *Sclerotinia sclerotiorum* (Lib.) Mass. in the State of Rio Grande do Sul, Brazil.]—*Rev. Agron. Pôrto Alegre*, 17, pp. 109–112, 1954. [English summary.]

Using Coe's technique [*R.A.M.*, 29, p. 45], the author induced the development of apothecia of *Sclerotinia sclerotiorum* from sclerotia in a period of 55 days from their collection on Brussels sprouts. In Rio Grande do Sul, Brazil, the fungus is also pathogenic to hollyhock, *Brassica juncea*, cabbage, sunflower, bean (*Phaseolus vulgaris*), peas, and *Myosotis arvensis*.

CRUICKSHANK (I. A. M.) & PALMER (T. P.). **Resistance of Swede varieties to dry-rot (Phoma lingam (Tode) Desm.).**—*N.Z. J. Sci. Tech.*, Sect. A, 36, 2, pp. 122–128, 1954.

Some of the work reported in this paper on *Phoma lingam* [*R.A.M.*, 34, p. 213] on swedes in New Zealand has already been noticed. In glasshouse and field trials at Lincoln and Palmerston North, 45 lines of swedes were tested for resistance to dry rot by a new inoculation technique which gave uniform infection in susceptible varieties. Swede plants were inoculated in the upper part of the swollen root with a spore suspension by means of a continuous flow hypodermic syringe having a 24 gauge needle. The fungus was cultured on whole pea seeds.

In the glasshouse Weibulls Balder and Wilhelmsburger Otofte were the most resistant, followed by N.Z. Wilhelmsburger and Weibulls Wilhelmsburger, all having lesions less than 3 cm. diameter and few pycnidia. In the field the last named gave the greatest number of resistant plants (50·8 per cent.), the figures for Weibulls Balder, Wilhelmsburger Otofte, and Webb's Grant King being 16·7, 14·1, and 10, respectively. N.Z. Wilhelmsburger is already being grown in New Zealand and from 1950 to 1952 was the only variety in the swede-growing area in which disease incidence did not rise to moderate or severe.

BÖNING (K.). **Düngungsversuche und Versuche mit chemischen Mitteln zur Bekämpfung des weissen Rostes an Meerrettich (Albugo candida [Pers.] O. Ktze).** [Manurial experiments and tests with chemical remedies for the control of white rust on Horse-Radish (*Albugo candida* [Pers.] O. Ktze).]—*Z. PflBau*, 6 (50), 1, pp. 1–21, 7 figs., 1955.

The results of experiments covering the period from 1931 to 1939 in the control of white rust (*Albugo candida*) [*Cystopus candidus*] of horse-radish in Bavaria [*R.A.M.*, 18, p. 365 and next abstract] by soil amendments with stable manure or synthetic fertilizers or spraying with Bordeaux mixture and other fungicides were not encouraging. The most hopeful long-term approach to the problem is the development of a resistant variety through selection from the thrifty types found in peasant holdings in the Alps.

Böning (K.). **Pflanzenschutzprobleme im Meerrettichbau.** [Plant protection problems in Horse-Radish cultivation.]—*Pflanzenschutz*, 7, 1, pp. 5–11, 12 figs., 1955.

Part of the information in this paper has been noticed from another source [see preceding abstract]. The disease second in importance to white blister is root-blackening, which shows as a brownish-black internal discoloration of circular, annular, or falcate cross-section. The breakdown of the vascular system causes the leaves to wilt, particularly in periods of drought. The author attributes the disease, provided it is parasitic, to *Verticillium armoraciae* [*V. dahliae*: cf. *R.A.M.*, 14, p. 419; 17, p. 10], at least in the majority of cases, and explains the lack of evidence of fungal infection by the death of the pathogen in the defensive necrotic reaction of the host. Inoculation experiments repeatedly produced symptoms similar to those described. The fungus is transmitted in planting material or attacks the young plant from the soil.

Control is complicated by the large range of likely alternative hosts, which do not, however, include cereals. Besides the use of healthy seed-stock, crop rotation is recommended: horse-radish should not be planted more than once in three years and should be preceded by cereals.

Baratte (J.), Darpoux (H.), Lebrun, & Durgeat. **Sur l'utilisation d'un ammonium quaternaire pour la désinfection des semences de Betteraves et la lutte contre divers parasites de la Betterave.** [On the use of a quaternary ammonium compound for the disinfection of Beet seeds and the control of various Beet parasites.]—*C. R. Acad. Agric. Fr.*, 39, 17, pp. 793–795, 1953.

A quaternary ammonium compound produced by the Institut Pasteur [Paris, France], Ca 605 or diethyl dodecyl benzyl ammonium chloride, was tested at the Central Station for Plant Pathology [Versailles] for fungicidal properties. *In vitro*, the LD 50 for spores of *Phoma betae* [*R.A.M.*, 33, p. 70] was located at concentrations between 0·1 and 0·01 p.p.m., and for *Glomerella cingulata* and *Venturia pirina* slightly below 1 p.p.m. The fungistatic limit for mycelial growth of *Cercospora beticola*, *P. betae*, and *Rhizoctonia violacea* [*Helicobasidium purpureum*] was about 500 p.p.m. and the fungicidal dose 1 in 1,000.

In glasshouse experiments, seed-clusters inoculated with a suspension of macerated mycelium and spores of *P. betae*, and three days later dipped into a 0·5 per cent. solution of Ca 605, gave 154 healthy seedlings from 100 clusters as against 128 from 100 untreated. With seed-clusters sown in soil inoculated with *Pythium* sp., concentrations of 0·5, 1, and 2 per cent. resulted in 68, 75, and 82 healthy seedlings, respectively, from 100 seed-clusters; untreated gave only 41. All results obtained with Ca 605 were significantly superior to those obtained with an organic mercurial containing ethoxybutyl mercury iodide plus ethoxypropyl mercury chloride. At no concentration were phytotoxic effects observed.

Plants treated with 2 per cent. Ca 605 within three days after inoculation with macerated mycelium and spores of *C. beticola* showed no symptoms at [leaf] opening and an average of 1·3 leaf spots ten days later as against 0·3 and 2·6, respectively, after treatment with 2 per cent. Bordeaux mixture, and 118 and 170 on the untreated. Leaf deformation, however, makes further tests with lower concentrations advisable.

Canova (A.). **Osservazioni sul 'mal del piede' della Barbabietola in Italia.** [Observations on 'foot rot' of Sugar Beet in Italy.]—*Ann. Sper. agr.*, N.S., 7, 5, pp. 1611–1619, 2 pl., 1953. [English summary.]

In the spring of 1951 beet seedlings, mostly from the provinces of Bologna and Ferrara, Italy, received at the Experimental Laboratory of Plant Pathology,

Bologna, were affected by foot rot or damping-off [cf. *R.A.M.*, 29, p. 486], having a brown discoloration of the rootlet and part of the hypocotyl. The following spring the condition was reported from all the sugar beet growing areas of northern and central Italy, and was particularly serious in Modena, Bologna, Ferrara, and Parma. Incidence commonly ranged from 70 to 100 per cent. Isolations from affected material in most cases yielded *Phoma betae* [32, p. 4], sometimes in association with *Pythium debaryanum* [29, p. 486] and a species of *Rhizoctonia* resembling *R.* [*Corticium*] *solani* [loc. cit.].

The author considers that unfavourable weather conditions in the spring of 1951 predisposed the plants to infection by reducing their vitality over a long period. Heavy rain during the summer and autumn aggravated infection of the developing seed-clusters. The beet varieties grown in Italy include a number of highly susceptible foreign ones. The most important factor in the spread of infection was, however, the failure to practise seed disinfection [3, p. 314; 33, p. 70 *et passim*], which offers a simple, rapid, and inexpensive method of control.

KNAPP (E.). **Kombinierte Prüfung von 6 Zuckerrübensorten auf Leistung und Resistenz gegen Cercospora.** [Combined assay of six Sugar Beet varieties for productivity and resistance to *Cercospora*.]—*Z. Zuckerind.*, 4 (79), 9, pp. 382–385, 1 diag., 1 graph, 1954. [English and French summaries.]

A detailed, tabulated survey is given of co-operative experiments performed in different parts of Western Germany, Austria, and Switzerland to determine the relative productivity and resistance to leaf spot (*Cercospora beticola*) of five sugar beet varieties in 1952 with the addition of a sixth in 1953 [*R.A.M.*, 34, p. 336]. The plants on half of each replicated plot were repeatedly inoculated with an aqueous hyphal suspension of the fungus, while those on the other half were sprayed six times during the growing period with 0·75 per cent. funguran (800 l. per ha.). On 7th September, 1953, the varieties in the infected halves of the 36 plots were rated for resistance as follows (averages on an infection scale ranging from 0 to 5): Kleinwanzleben CR, 1; Buszczynski CLR, 2 [34, p. 14]; Beta 242/53, 2·2; Kleinwanzleben Polybeta, 3·2; Kleinwanzleben E, 3·5; and Kleinwanzleben N, 3·8. The corresponding leaf and beet yields (expressed as percentages of those obtained from the same varieties in the treated plots, which were free from infection) were 81·4 and 95·7, 74·4 and 87·8, 64·6 and 84·3, 45·9 and 78·1, 41·7 and 72·3, and 39·9 and 70·3, respectively; the sugar yields were 94·6, 85·3, 79·4, 70·2, 63·4, and 62·7, respectively; the ash content ranged from 103·9 in the most resistant to 117·5 in the most susceptible variety and that of harmful nitrogen from 109 to 129·9.

It is apparent from these data that even such highly susceptible varieties as Kleinwanzleben N give comparatively high yields when protected by spraying, and it is considered that their replacement by resistant ones would be uneconomic, even allowing for the additional expenditure necessitated by repeated fungicidal treatments.

DEKKER (J.). **Internal seed disinfection by an antibiotic from Streptomyces rimosus.**—*Nature, Lond.*, 175, 4459, pp. 689–690, 1 graph, 1955.

In investigations at the Laboratory of Phytopathology, Wageningen, Holland, a suspension obtained from a culture of *Streptomyces rimosus* from the Centraalbureau voor Schimmelcultures, Baarn, was markedly inhibitory to certain fungi and bacteria, including the pea seed pathogens *Ascochyta pisi* [*R.A.M.*, 32, p. 330] and *Mycosphaerella pinodes*. Seeds heavily infected with *A. pisi* were soaked for different periods in solutions or suspensions of the actinomycete and the number bearing mycelium on the seed coat were counted a week later. The percentage of infected seeds of the varieties Dopper Eminent and Servo after being soaked in a suspension for 18 hours was 8·5 and 6, with 77 and 60, respectively, for seeds soaked in water.

There was some evidence of toxicity when cultures over two weeks old were used. The use of a bacterium known to be inhibited by *S. rimosus* demonstrated that at least one antibiotic component of the suspension penetrated the seeds and killed *M. pinodes* inside. Of the two antibiotics known to be produced by *S. rimosus*, terramycin [34, pp. 21, 49] did not inhibit *A. pisi* either *in vitro* or *in vivo*, but crude rimocidin [33, pp. 618, 738] did so by penetrating the seeds. Furthermore, steeping in 25 and 50 p.p.m. solutions decreased the number of seeds bearing mycelium of *A. pisi* while a 100 p.p.m. solution gave almost complete control.

Hubbeling (N.). **Topvergeling bij Erwten, een virusziekte.** [Tip yellowing of Peas, a virus disease.]—Abs. in *Tijdschr. PlZiekt.*, 61, 1, pp. 19–20, 1955.

During a visit to West Germany the author's attention was drawn by [L.] Quantz to a virosis of peas named leaf roll, which is transmissible exclusively by aphids [*R.A.M.*, 34, p. 272] and is evidently identical with the disease erroneously designated '*Fusarium solani* foot rot' in Holland [34, p. 271]. The confusion has no doubt arisen through the similarity of symptoms and the possibility of isolating species of *Fusarium* from the stems of healthy plants, but only on injured plants growing under very unfavourable conditions can the fungi assume a severe character.

'Tip yellowing' may be distinguished from fungal infection by the narrowing and chlorosis of the apical leaves, often accompanied by slight curling and an erect habit, and necrosis of the sieve-tubes in the stems. The great majority of cases of 'foot rot' in central and south Holland are caused by the leaf roll virus, which is much less prevalent in the north, with its relatively sparse aphid population. In 1954 'tip yellowing' was very widespread in pea crops that had received no insecticidal treatment, especially near lucerne and broad beans. [H.J.] de Fluiter succeeded in transmitting the virus from lucerne to peas and broad beans.

Van der Vliet (M.). **De bestrijding van de Bonenroest.** [The control of Bean rust.] —Abs. in *Tijdschr. PlZiekt.*, 61, 1, p. 26, 1955.

Satisfactory results in the control of bean (*Phaseolus* spp.) rust (*Uromyces appendiculatus*) in 1953 and 1954 are reported from the Phytopathological Service, Wageningen, Holland, using zineb with a mist-blower at a concentration of 5 per cent. or as a spray at 0·35 per cent. The first application must be made before any signs of infection appear.

Cheo (P. C.). **Effect of seed maturation on inhibition of southern Bean mosaic virus in Bean.**—*Phytopathology*, 45, 1, pp. 17–21, 1955.

In inoculation experiments at the Horticultural Crops Research Branch, United States Department of Agriculture, Beltsville, Maryland, southern bean mosaic virus was found to be present in all floral and fruit parts of systemically infected bean (*Phaseolus vulgaris*) varieties, using Kentucky Wonder as the local-lesion assay host for quantitative studies of virus concentration in the different organs [*R.A.M.*, 27, p. 403]. The sepals, petals, and young fruits contained the same amounts as infected foliage. As the seed matured, the virus content of the embryo increased while that of the seed coat and pod decreased [23, p. 204]. In the embryo, but not in the seed coat and leaves, the virus was very rapidly inhibited by dehydration, possibly as a sequel to chemical changes incidental to the final stages of ripening.

Crude extracts from bean seed contained an inhibitor of southern bean mosaic virus which was thermostable, resistant to both acid and alkali, and more potent in mature or germinated than in unripe seed. It did not modify the susceptibility to infection of the host cells.

Grümmer (G.) & Mach (F.). **Die Behandlung brennfleckenkranker Bohnen mit Patulin und Streptomycin.** [The treatment of anthracnose-diseased Beans with patulin and streptomycin.]—*Zbl. Bakt.*, Abt. 2, 108, 17–18, pp. 449–464, 6 figs., 10 diags., 1 graph, 1955.

Judging by the results of experiments on the control of bean [*Phaseolus vulgaris*] anthracnose (*Glomerella* [*Colletotrichum*] *lindemuthianum*]) in the Saxa variety at the Ernst-Moritz-Arndt University, Greifswald, Germany [*R.A.M.*, 32, p. 658], the seeds can be almost completely freed from infection by 24 hours' immersion in a 0·05 per cent. solution of streptomycin. In small-scale tests a comparable action was exerted by clavacin (patulin) at 0·1 per cent. At the moment, however, the high cost of the antibiotics would preclude their practical use as fungicides except possibly in the crude state.

Sristava (H. C.) & Mathur (P. B.). **Cold storage of field Beans (Dolichos lablab).**—*Indian J. Hort.*, 11, 4, pp. 125–128, 2 graphs, 1954.

In studies on the storage of field beans (*Dolichos lablab*) at different temperatures at the Central Food Technological Research Institute, Mysore, India, the principal causes of disease during storage were *Colletotrichum lindemuthianum* [*R.A.M.*, 30, p. 542], producing pinkish or brownish spots on the seeds and mycelium on the pods at high humidities, and *Rhizopus nigricans* [*R. stolonifer*], which was very common at 39° to 42° F. and above. The optimum conditions for storage appear to be 32° to 35° and 85 to 90 per cent. relative humidity, at which pods may be kept for 21 days and seeds for seven.

Røyset (S.). **Ein Gulrotsjukdom av ukjend årsak.** [A Carrot disease of unknown etiology.]—*Norsk Landbr.*, 21, 8, pp. 174–176, 1955.

Carrots in Norway suffer from a foliar wilt and discoloration and brown spotting of the roots which appear to be due to nutritional disturbances. Analyses of affected material revealed an abnormally low cobalt content in the roots and a still greater deficiency in the foliage, as compared with healthy plants. Molybdenum was low and zinc high in the roots, while both were normal in the leaves. It is possible, therefore, that a shortage of cobalt may be implicated in the condition though this trace element does not normally rank as an essential nutrient.

Collingwood (C. A.) & Croxall (H. E.). **Carrot fly injury and 'canker' of Parsnips in the West Midlands.**—*Plant Path.*, 3, 3, pp. 99–103, 1954.

Heavy losses attributed to parsnip canker [*R.A.M.*, 33, p. 463] having been sustained in the West Midlands in 1946, variety observation plots were laid down by the National Agricultural Advisory Service, Evesham, at various centres in Worcestershire, Warwickshire, and Staffordshire. The evidence obtained during the period 1947–53 in all the trials showed that control of carrot fly (*Psila rosae*), particularly in late summer, was consistently accompanied by reduction of canker. The chief factor favouring the development of canker appeared to be high soil moisture.

A number of fungi, including species of *Phoma* and *Fusarium*, *Botrytis cinerea*, *Penicillium* spp., *Mucor* spp., and *Verticillium dahliae* were obtained from cankered roots, but no one organism or group of organisms appeared to be consistently associated with the condition. While the authors do not suggest that injury by *Psila rosae* is the sole cause of parsnip canker, it is, in the West Midlands, an extremely important precursor of the condition, and control of the insect greatly reduces losses. Other types of injury were not usually associated with the subsequent development of canker.

Powlesland (Ruth) & Brown (W.). **The fungicidal control of Lettuce downy mildew, caused by Bremia lactucae.**—*Ann. appl. Biol.*, 41, 3, pp. 461–469, 1 pl., 1954.

In preliminary greenhouse experiments at the Imperial College Field Station, Slough [Bucks], on the control of lettuce mildew (*Bremia lactucae*) by some of the newer organic fungicide sprays, the materials giving the best protection were found to be zineb and thiram, followed in descending order of merit by ferbam, ziram, phygon, and spergon. In preliminary field experiments in 1950 on seedlings under Dutch lights the results in general confirmed this. A further experiment was then carried out in 1951–2 in which an earlier and much more severe attack of mildew was established. Thirty frames were sown on 11th October, 25 being partitioned into half-frames. Half-frames were sprayed with thiram (16 and 4 gm. per l.), zineb (4 and 1 gm. per l.), or ziram (16 gm. per l.) at the rate of 25 ml. per half-frame, the other half-frame being left unprotected. Next day all the frames were sprayed with a spore suspension of *B. lactucae*. Five frames randomized among the series remained unsprayed and uninoculated. On 9th January, 1952, it was found that 96 to 99 per cent. of the sprayed and only 4 to 8 per cent. of the unsprayed plants had retained their cotyledons. The average weights (wet) of the sprayed and unsprayed were, respectively, 30 and 19·8 gm. on 9th January and 89·3 and 67·2 gm. on 28th February. When the frames were cleared for transplanting the differences between the different fungicidal treatments were negligible, but the sprayed and unsprayed lots had, respectively, 0·53 and 50·2 per cent. plants with mildew lesions; 1·3 and 23·5 per cent. had *Botrytis cinerea* lesions; and 98·2 and 26·3 per cent. were apparently clean. Thiram (16 gm. per l.) gave a final stand of 330 plants per half-frame with 86·4 per cent. survival in the field, the corresponding figures for the untreated being 241 and 68·4 per cent. The corresponding figures for zineb (4 gm. per l.) were 366 and 67·6 per cent., with 234 and 74 per cent. for the untreated; and those for ziram (16 gm. per l.) 332 and 88·8 per cent. with 277 and 72 per cent. for the untreated. The over-all conclusion from this experiment is that mildew reduced the number of seedlings available for transplanting, diminished their size and weight, curtailed survival in the field, and slightly delayed maturity. Further experiments with the same three materials and ferbam gave similar results. It is concluded that, taking the experiments as a whole, the best protection of lettuce foliage against downy mildew was given by thiram and zineb.

Couch (H. B.) & Gold (A. H.). **Rod-shaped particles associated with Lettuce mosaic.**—*Phytopathology*, 44, 12, pp. 715–717, 1 fig., 1954.

At the Department of Plant Pathology, University of California, Davis, flexuous, rod-shaped particles, averaging 746 by 22 mμ, were detected in lettuce plants of the Bibb and Great Lakes varieties naturally infected by lettuce mosaic virus and in the floral and vegetative tissues of *Zinnia elegans* and *Tagetes erecta*, the vegetative tissue of chicory and aster, and in local lesions on *Gomphrena globosa* inoculated with the virus from lettuce. Comparable samples from healthy plants were free from such particles. Concentration of the rods in the droplet patterns was less than 10^{10} per gm. fresh weight. The application of methods tending to enhance infectivity of the virus inoculum preparations [*R.A.M.* 18, p. 650] failed to give an appreciable increase in the number of particles recovered from the host tissue.

Freire (J. R. J.). **Uma bacteriose em Alface (Lactuca sativa L.) causada por Pseudomonas cichorii (Swingle) Stapp.** [A bacteriosis of Lettuce (*Lactuca sativa* L.) caused by *Pseudomonas cichorii* (Swingle) Stapp.]—*Rev. agron. Pôrto Alegre*, 17, pp. 36–40, 1954. [English summary.]

During the wet seasons from July to October, 1948 to 1953, lettuce crops in the

State of Rio Grande do Sul, Brazil, sustained heavy damage (often up to 100 per cent.) from the leaf blight caused by *Pseudomonas cichorii* [cf. *R.A.M.*, 17, p. 98], not previously recorded in the country. The local isolates differed from the type species only in the production of hydrogen sulphide and the absence of a surface pellicle in nutrient broth. Control should be based on seed-bed and field sanitation, including adequate tillage, drainage of excessively damp sites, crop rotation, seed disinfection, removal and burning or deep burial of infected material, and sufficiently wide spacing to admit of the free passage of air between the plants [cf. 27, p. 404].

Jacks (H.). **Seed disinfection. X. Effect of seed protectants on emergence of Spinach.**—*N.Z. J. Sci. Tech.*, Sect. A, 36, 2, pp. 129–133, 1954.

In further experiments in this series [cf. *R.A.M.*, 33, p. 651] at the Plant Diseases Division, Auckland, New Zealand, 40 fungicides were tested for the protection of spinach seed against pre-emergence damping-off in soil artificially inoculated with *Pythium ultimum* [cf. 33, p. 169], the seed being shaken with the protectant [33, p. 127]. Yellow cuprocide, phygon, phygon XL, agrimax M (4 per cent. phenyl mercuric dinaphthyl methane disulphonate), verisan (1·5 per cent. methoxyethyl mercury), N.I. ceresan, thiram, fernasan, thirodust, fermspray, copper 8-quinolinolate, 36L(98 per cent. 1-(*p*-sulphamylephenyl)-3.5-dimethyl-4-nitrosopyrazole), and flit 406 (50 per cent. captan), all at 2 per cent. of seed weight, were effective, significantly increasing emergence in a preliminary trial. In final tests, using these materials at 1 per cent., the mean percentage of healthy plants ranged from 46·6 to 60·7 and the diseased from 19·3 to 30·7 as against 30 healthy and 14·5 diseased in the untreated.

Baldacci (E.) & Corradini (V.). **Ricerche sulla malattia del Peperone detta 'moria' nel Vogherese con indicazioni di prevenzione e di lotta.** [Studies on the Chilli disease termed 'decline' at Voghera with notes on prevention and control.]—Reprinted from *Quadr. Pio Ist. agric. Carlo Gallini*, 32 pp., 4 pl., 1 diag., 1 graph [? 1953].

Since it was first observed in 1950 wilt or tracheomycosis of chillies at Voghera, Italy, caused by *Fusarium solani*, has reduced production by about one-third. Sudden wilting of the aerial organs occurs and death follows within two days. In some cases the plants remain in a semi-moribund state for 15 to 20 days or more. There is a blackish, necrotic zone at the collar, often depressed and completely encircling the stem. Beneath this lesion some of the vessels are occluded by gum, the occlusions being fewer a few centimetres above and below. The root system is markedly reduced in comparison with healthy plants.

The causal organism was isolated from diseased tissues and reproduced typical symptoms on being inoculated in an incision at the collar of healthy chilli seedlings. No infection resulted from spraying seedlings with a spore suspension.

Infection takes place in the field after transplanting as a result of the roots being wounded. It is rare in the nursery as the soil there is generally sterilized. Predisposing factors include lack of crop rotation, accumulation of organic material in and on the soil, the flow of irrigation water from infected fields, and high soil temperatures, which, in June, reach the optimum for the pathogen (26° to 28° C.).

Numerous experiments demonstrated the moderate efficiency of ethylene dibromide and chloropicrin as soil fumigants, and more particularly of formalin and paraformaldehyde, used before sowing and transplanting. Zineb appeared promising as a therapeutant when sprinkled on the leaves every eight days from June to August.

A programme for the prevention and control of wilt is embodied in an appendix.

Scrivani (P.). **Ricerche su di una specie di Fusarium (Fusarium solani (Mart.) App. et Wr.), producente una tracheomicosi del Peperone (Capsicum annuum).** [Studies on a species of *Fusarium* (*Fusarium solani* (Mart.) App. & Wr.) producing a tracheomycosis of Chilli (*Capsicum annuum*).]—*Phytopath. Z.*, 21, 1, pp. 97–103, 5 figs., 1953. [German and English summaries.]

Fusarium solani var. *martii* was isolated from chilli seedlings affected by tracheomycosis near Voghera, Italy [see preceding abstract]. Although it does not produce lycomarasmin [*R.A.M.*, 33, p. 121], culture filtrates were toxic to excised tomato and chilli shoots at dilutions up to 1 in 16.

Mehta (P. R.) & Mathur (S. C.). **Efficacy of various fungicides in controlling Cercospora leaf spots of Groundnut (Arachis hypogea L.).**—*Agric. Anim. Husb., Uttar Pradesh*, 5, 2, pp. 11–12, 1954.

In field experiments in 1950 and 1951 at Kanpur Research Farm, Uttar Pradesh, India, fairly effective control of *Cercospora arachidicola* [*R.A.M.*, 30, p. 405] and *C. personata* [32, p. 176] of groundnut was obtained with sulphur dusting (six applications at 10 week intervals) or spraying with 0·15 per cent. cupravit, 0·15 per cent. perenox, or 2–2–50 Bordeaux mixture, all three plus linseed oil sticker. The yield was increased by 45, 30, 20, and 15 per cent., respectively. Infection was reduced from 30 to 50 per cent. diseased leaf area in the untreated to 5 to 20 per cent. by these treatments.

Mathur (R. S.). **Diseases of pulse crops in Uttar Pradesh.**—*Agric. Anim. Husb., Uttar Pradesh*, 5, 1, pp. 24–28, 1954.

Brief notes are given on the economic importance, symptoms, and control of the most important diseases of pulses in Uttar Pradesh, India, including the following. Rust [*Uromyces ciceris-arietini*: C.M.I. map No. 235] is an important disease of gram (*Cicer arietinum*) but appears late in the season and generally causes little damage. *Lathyrus sativus* is attacked by downy mildew (*Peronospora viciae*) [cf. *R.A.M.*, 22, p. 112] and cowpea by anthracnose (*Glomerella* [*Colletotrichum*] *lindemuthianum*) [cf. 30, p. 263], the latter often causing considerable damage. Soybean leaf spot (*Cercospora daizu*) [cf. 31, p. 458] occurs annually, particularly on late-maturing varieties, and sometimes causes severe losses.

Cours (G.). **Amélioration des plantes : le Manioc.** [Plant improvement: Cassava.] —*Rech. agron. Madagascar* 2, *C. R. 1953*, pp. 78–88, 8 figs., 1954.

This article deals with foliar diagnosis and mineral deficiencies of cassava, and fertilizer experiments based on studies at the Agricultural Station, Lake Alaotra, Madagascar. The symptoms of potassium deficiency are a stunting of the whole plant and the death of the extremities. At first, the branches live on the reserves in the cutting, but after three or four months growth is arrested, the leaves remain small, the internodes are short, and the diameter of the wood decreases; new leaves roll up, become pale, and dry at the tip. *Gloeosporium manihotis* [cf. *R.A.M.*, 30, p. 213] then appears on the branches, petioles, or leaf blades. The infected areas turn black and die, and the parts above them wither. New shoots in turn become infected; the stunted plants are unable to withstand the cold season, the upper parts and sometimes almost the whole aerial portion withers. When growth is resumed, the plant puts out one or two vigorous branches at the base of the stem, and after a few months these also display symptoms of potassium deficiency.

In tests on a potassium-deficient lateritic soil near Moramanga affected cassava plants completely recovered after a soil application of 105 kg. per ha. of potassium chloride (50 kg. potassium per ha.); the symptoms became almost imperceptible when half the amount was given. In another test on potassium-deficient soil one

application of 100 kg. of potassium chloride per ha. increased the yield by 16 metric tons per ha., one application of 3 kg. potassium per ha. increasing it by one metric ton per ha.

Freire (J. R. J.). **Considerações acêrca da provável identidade entre Bacterium robice Bour. e Xanthomonas manihotis (Arthaud Berthet) Burk.** [Considerations regarding the probable identity of *Bacterium robice* Bour. and *Xanthomonas manihotis* (Arthaud Berthet) Burk.]—*Agros, Pôrto Alegre*, 6, 3, pp. 111–117, 1 fig., 1953. [English summary. Received April, 1955.]

The symptoms of the foliar diseases of cassava caused by *Bacterium robice* in Madagascar [see Bouriquet: *R.A.M.*, 27, p. 79] and *Xanthomonas manihotis* in Brazil [31, p. 589] are similar; the latter also attacks the stems. Moreover, there are certain resemblances in the characters of the two organisms which point to their possible identity, but so far the author has been unable to procure a culture of *B. robice* for the necessary comparative studies.

Lefering (T. W.). **Bladvlekkenziekte van Augurk en Komkommer, veroorzaakt door Pseudomonas lachrymans (E. F. Sm. en Bryan) Carsner en Glomerella lagenarium (Pass.) Stevens.** [Leaf spot disease of Gherkin and Cucumber caused by *Pseudomonas lacrymans* (E.F. Sm. & Bryan) Carsner and *Glomerella lagenarium* (Pass.) Stevens.]—Abs. in *Tijdschr. PlZiekt.*, 61, 1, pp. 21–22, 1955.

Pseudomonas lacrymans was first observed on gherkins in Holland two years ago, and in 1954 it appeared to be widespread, causing fairly severe damage. During the last four years *Glomerella* [*Colletotrichum*] *lagenarium* has also been prevalent on the same host in the Venlo district, and in 1954 it was found in every field inspected, causing up to 40 to 50 (average 20) per cent. reduction in yield. *P. lacrymans* is seed-transmissible and *C. lagenarium* is probably perpetuated to a small extent in the same way as well as through the soil. Inoculation of the seed with anthracnose spores, even when carried out a long time before sowing, resulted in nearly 100 per cent. seedling infection, while damping-off may be caused by contamination of the soil. At Straelen, Germany, both pathogens have been found on cucumbers in frames.

Van Der Helm (G. W.). **Over vruchtvuurresistentie van Komkommers.** [On resistance to Cucumber scab.]—Abs. in *Tijdschr. PlZiekt.*, 61, 1, p. 19, 1955.

Partial control of cucumber scab (*Cladosporium cucumerinum*), a serious disease in Holland, may be achieved by treatment with bulbosan [*R.A.M.*, 31, p. 479], but many difficulties are involved in the operation. In 1947 seed of the resistant but commercially unacceptable American variety Highmoor was obtained from breeding experiments at Sloten. Crossed and back-crossed with Lentse Gele [Spring Yellow], it eventually produced a yellow variety which proved to be suitable for the Dutch market and is now extensively cultivated in the Amsterdam district under the name of Vios. A resistant white variety appeared fortuitously in the course of the trials and permission has been sought for its cultivation under the name of Mabro. In 1952 crosses between Highmoor and the dark green Spiers were initiated and have already resulted in the development of two resistant varieties, Amato and Proso. Further work on the incorporation of resistance to scab into well-known Dutch cucumbers is in progress.

Conroy (R. J.). **Fusarium foot root of Cucurbits.**—*Agric. Gaz. N.S.W.*, 64, 12, pp. 655–658, 2 figs., 1953. [Received 1954.]

Some of this information concerning the occurrence of *Fusarium* [*Hypomyces*] *solani* f. *cucurbitae* causing foot rot of cucurbits in New South Wales has already been noticed from another source [*R.A.M.*, 33, p. 202]. Of three soil temperatures

tested the highest (95° F.) was most favourable to rapid symptom expression in Early White squash seedlings growing in cans of infested soil, although all the plants tested were killed after four weeks at 86° and 77°. The fungus survived in sandy loam for at least 18 months in the absence of susceptible plants. After two years' storage 2·6 per cent. of the viable Triamble pumpkin seed from the Manning River area gave rise to infected plants [cf. **27**, p. 308].

Seed-producers should take every care to ensure that no seed from fruit showing any type of rot is included in the fermentation vat, particularly in an area such as Manning River. Infested soil should not be planted to cucurbits again until at least three years have elapsed. Spread of the fungus in the soil by means of tools or irrigation water should be avoided.

Rankin (H. W.). **Effectiveness of seed treatment for controlling anthracnose and gummy-stem blight of Watermelon.**—*Phytopathology*, 44, 12, pp. 675–680, 1 fig., 1954.

In trials carried out since 1950 at the Georgia Coastal Plain Experiment Station, Tifton, the seed treatments in general use did not completely eliminate watermelon anthracnose (*Colletotrichum lagenarium*) [*R.A.M.*, 32, p. 298] or gummy-stem blight [black rot] (*Mycosphaerella melonis*) [29, p. 135]. The best results were obtained by five minutes' immersion in mercuric chloride at a strength of 1 in 1,000, followed by washing for ten minutes and drying, which reduced the incidence of seedling infection by *C. lagenarium* from 43·1 to 1·5 per cent. and that of *M. melonis* from 42·6 to 6·2 per cent. Next in order of efficiency came phygon dust (1 per cent. to 200 parts seed by weight), with 16·4 and 19·6 per cent. infection, respectively. Semesan, 2 per cent. ceresan, arasan, and spergon dusts were less effective.

Both species attacked the seedlings at or just below soil-level. Attempts to isolate *C. lagenarium* from the interior of seeds harvested from melons with heavy surface infections were unsuccessful. The lesions never penetrated much beyond ¼ in. in depth and did not extend through the rind. Melons that have split in the field may produce seed contaminated by the spores of either pathogen through the agency of spattering rain or insects, but the mechanical seed-saving process appears to offer the best opportunity for infection. *C. lagenarium* could not be isolated from seed lots which had given rise to high percentages of diseased seedlings and only one seed yielded *M. melonis*, though many other fungi, including *Fusarium*, *Helminthosporium*, *Rhizopus*, *Aspergillus*, and *Penicillium* spp., *Sclerotium rolfsii*, and *S. bataticola* [*Macrophomina phaseoli*], and bacteria developed in pure culture. However, when uninfected seed was removed directly from the fruits, inoculated, and incubated for several days, *C. lagenarium* and *Mycosphaerella melonis* were readily recoverable, the critical invasion times being 24 and 12 hours, respectively. The examination of sections stained with cotton blue revealed the penetration of *C. lagenarium* into the epidermal layer of palisade cells and the sclerenchyma layers of the seed coat, with occasional strands of mycelium extending into the parenchyma and inner epidermis. *M. melonis* invaded the epidermal and sclerenchyma cell layers and often reached the parenchyma and inner epidermal layers. Pycnidia were found developing in the outer epidermis and the same organs or sclerotioid bodies were observed in the sclerenchyma layers. *C. lagenarium* could not be isolated from the seed cotyledons or embryo, both of which, however, yielded *M. melonis* in a high percentage of cases.

Tocchetto (A.). **Fusariose da Parreira.** [Fusariosis of the Vine.]—*Rev. Agron. Pôrto Alegre*, 17, pp. 82–89, 6 figs., 1954. [English summary.]

The symptoms of a hitherto unreported disease chiefly attacking Herbemont vines (hybrids of *Vitis aestivalis*, *V. cinerea*, and *V. vinifera*), first observed in

Pôrto Alegre, Brazil, 10 to 15 years ago, appear at the end of the spring with rising temperatures, when the leaves begin to shrivel at the margins. Sections through an affected branch reveal a dark vascular discoloration. The bunches die while still green. As time goes on the main branches die off and are replaced by new ones from the living portion of the stem, which soon succumb in their turn and the plant dies. Infection travels from the base upwards and old, well-lignified vines withstand it for several years, whereas new ones collapse after two at the most. Decortication of the stem discloses alternate dark, invaded, and lighter, healthy bands of tissue.

Among the fungi isolated from diseased material, including *Dothiorella* sp., a new variety of *Fusarium oxysporum*, which is designated *herbemontis* [without a Latin diagnosis], predominated. The mycelium is cottony, decumbent, sometimes submerged, cream-coloured, later turning purple. The conidia are non- to quinqueseptate, averaging from 9·4 by 3·4 to 40·2 by 5·5 μ. The globose, intercalary and terminal chlamydospores are usually simple.

Control should be based on the sanitary precautions indicated for vines in general, including avoidance of injuries, especially to the underground system; establishment of new sites at a distance from the infested areas; and use of resistant stocks for grafting.

Kassanis (B.). **Heat-therapy of virus-infected plants.**—*Ann. appl. Biol.*, 41, 3, pp. 470–474, 1 pl., 1954.

A brief summary of some of the results of these experiments at Rothamsted Experimental Station to ascertain whether heat therapy might be effective in freeing infected plants from certain heat-stable viruses has been noticed [*R.A.M.*, 33, p. 585]. Potted plants infected at least three weeks previously and showing systemic symptoms were used and were heat-treated in a specially devised incubator in the form of a miniature glasshouse at 36° C. for three to four weeks. Cuttings from the side shoots or main stems of the treated plants were made at the end of the treatment and rooted. Plants freed from virus in addition to those already reported [loc. cit.] were cucumber infected with cucumber mosaic virus, tobacco and tomato with tomato aspermy virus, and *Abutilon striatum* with *Abutilon* variegation virus.

The leaves formed during the heat treatment were free from symptoms; test plants inoculated from them remained uninfected. After being kept for various periods at 20° most of the treated plants developed symptoms again, though some cucumber and *D. stramonium* plants infected with cucumber mosaic virus, some tobacco and tomato plants infected with tomato aspermy virus, and some *A. striatum* plants infected with *Abutilon* variegation virus remained permanently healthy. From the few cuttings that developed symptoms, viruses were regularly transmitted to other plants, but repeated attempts over periods of four to six months to transmit any virus from symptomless ones all failed.

The method failed to cure tomato plants infected with tomato spotted wilt virus, potato, tomato, and *D. stramonium* plants infected with potato virus X, and tobacco plants infected with tobacco mosaic virus, though it reduced their virus content. It is clear that heat therapy is not applicable to all viruses with high thermal inactivation points and not to some with low ones. It may be of significance that tomato bushy stunt, cucumber mosaic, and carnation ring spot viruses, to which heat therapy was successfully applied, have spherical particles and small temperature coefficients of thermal inactivation, whereas potato virus X and tobacco mosaic viruses, with which heat therapy failed, and potato virus Y and henbane mosaic virus, with which preliminary results suggested probable failure, have rod-shaped particles and large temperature coefficients of thermal inactivation.

DAY (M. F.) & IRZYKIEWICZ (H.). **On the mechanism of transmission of non-persistent phytopathogenic viruses by aphids.**—*Aust. J. biol. Sci.*, 7, 3, pp. 251–273, 1 fig., 1954.

Experiments were carried out at the Division of Entomology, Canberra, Australia, to test a working hypothesis formed by the authors to explain the mechanism of the transmission of non-persistent phytopathogenic viruses by aphids. The hypothesis is that during the probing of infected tissue the stylets of the aphid become contaminated with virus, and only this fraction is significant in disease transmission; some virus may be ingested, but once it reaches the midgut it plays no part in disease transmission. Some of the virus on the stylets is inactivated by the salivary fluids, though viruses differ in their susceptibility to this inhibition, and different species of aphids vary in the production of the inhibitor. Fasting decreases the activity of the salivary inhibitors.

Details of the experiments with relevant data from the literature (66 references) are given under the main headings (*a*) Is virus carried on the mouth-parts? (*b*) Are viruses inhibited by insect salivary secretions? (*c*) What are the effects of fasting upon the aphid vectors? and (*d*) What explanations are available for the observed specificity in virus-vector relationships?

Experiments by the authors on the feeding of *Myzus persicae* (*Aust. J. biol. Sci.*, 6, pp. 98–108, 1953) indicated that it is unlikely that sufficient material to reach the midgut could be ingested during the very short feeding periods that resulted in virus transmission. Using *M. persicae* on turnip it was demonstrated that cauliflower mosaic virus was not transmitted after the aphid had moulted unless it was allowed further access to the viruliferous host. In 1952 Bradley dipped the stylets of aphids into a concentrated solution of tobacco mosaic virus and then allowed the insects to feed on the test plants [*R.A.M.*, 32, p. 10]. Absence of infection was taken as evidence that the virus was not carried on the outside of the stylets. The authors attempted, therefore, to compare the ability of *M. persicae* to transmit cucumber mosaic virus after feeding (*a*) on an infected leaf and (*b*) on a concentrated solution of plant sap. Transmission after feeding on the leaf of infected spinach was readily obtained (5 of 8). Aphids fed through a plastic membrane on sap from a similar leaf gave no infections, though this result may have been due to the presence of an inhibitor in the plant [cf. 32, p. 231]. Sap from infected *Nicotiana glutinosa* was then clarified by low-speed centrifugation. This solution was highly infectious when mechanically inoculated to *N. glutinosa* or spinach, but 90 *M. persicae* individuals did not become infectious when fed through a plastic membrane on the solution for periods of 30 seconds to five minutes and then transferred in groups to spinach seedlings. It appears, therefore, to be probable that the aphid is unable to pick up virus from the solution as it does from the leaf. Hence, the conclusion that the virus is not carried on the exterior of the stylets is not justified by the results of Bradley's experiments. The authors' findings support the view that the viruses are carried on the mouth-parts.

Experimental evidence also shows that the saliva of certain insects is inhibitory to tobacco mosaic virus and potato virus Y. Indirect evidence that aphid saliva is inhibitory is provided by the fact that some viruses persist in their vectors for shorter periods during feeding than when the vector is fasted. Furthermore, short acquisition feeds were shown with some viruses to produce infections more efficiently than long acquisition feeds. Those viruses in which this relationship is not found are probably insensitive to the salivary inhibitor.

Fasting exerted no marked effect on digestive enzyme formation, rate of penetration of the stylets, or quantity of material ingested. On the other hand, the demonstrable effect of fasting on feeding behaviour, stylet ensheathment, and the formation of saliva would appear to be sufficient to explain the effect on virus transmission. The hypothesis that the greatest effect of fasting is on the salivary

inhibitor is supported by these results. Finally, evidence is adduced to show that the occurrence of specificity and differences in vector ability are not arguments against the hypothesis that non-persistent viruses are transmitted mechanically.

On a basis of the evidence brought forward it is considered desirable to find alternative terms for the groupings of aphid-borne viruses. 'Vector-direct' is suggested for a virus which is transmitted on the insect's mouth-parts; it is usually readily sap-transmissible; fasting usually increases the vector's efficiency; there is not a long latency in the vector, and the virus does not multiply in it. Many such viruses attain relatively high concentrations in the mesophyll tissues and produce mosaic diseases in plants. 'Vector-latent' is suggested for viruses transmitted by a mechanism involving ingestion, passage through the gut to the haemocoele, and reinjection with the saliva; there is often a long latency between the acquisition feed and a successful inoculation feed; many of these viruses are specific to a few species of vector and most of them are not sap-transmissible; fasting usually does not affect efficiency; some are confined to the vascular tissues of the host, and they may multiply in their vectors.

Smith (K. M.) & Lauffer (M. A.). **Advances in virus research. Volume II.**—x+313 pp., 12 figs., 6 diags., 31 graphs, 1954. $7.

The following contributions (each followed by a bibliography) to this further series of reports on the progress of virus research [cf. *R.A.M.*, 33, p. 405] are wholly or partially concerned with the phytopathological aspects of the subject: inheritance of resistance to viral diseases in plants by F. O. Holmes (pp. 1–30); inhibitors and plant viruses by F. C. Bawden (pp. 31–57); the chemical constitution of viruses by C. A. Knight (pp. 153–182); electron microscopy of viruses by R. C. Williams (pp. 183–239); and hydration of viruses by M. A. Lauffer and I. J. Bendet (pp. 241–287).

Chamberlain (E. E.). **Plant virus diseases in New Zealand.**—*Bull. Dep. sci. industr. Res., N.Z.* 108, 255 pp., 1 col. pl., 185 figs., 1954.

Part 1 (pp. 15–43) of this volume, intended primarily for the use of those concerned with horticulture and agriculture in New Zealand, contains a general account of plant viruses, techniques used in virus investigations, and control of virus diseases. Part 2 (pp. 44–231) includes descriptions and illustrations of the plant virus diseases known in New Zealand, with notes on their economic importance and control. Among those dealt with is bootlace disease of tree tomato (*Cyphomandra betacea*), attributed to a mixture of cucumber mosaic virus [*R.A.M.*, 28, p. 37] and potato virus Y, which causes narrowing and distortion of the leaves and severe yield reductions in all districts where the crop is grown. The symptoms of plum mosaic virus [31, p. 336] on a number of stone fruit varieties are tabulated and illustrated. There are 230 references, and appendices listing the plant viruses present in New Zealand with their natural hosts and methods of transmission, virus disease synonyms, the plant virus hosts that are known to become infected under natural conditions in the country, and the insect vectors of plant viruses occurring in New Zealand, with a glossary of technical terms.

Luria (E. S.). **General virology.**—xiii+427 pp., 52 figs., 8 diags., 28 graphs, New York, John Wiley & Sons, Inc.; London, Chapman & Hall, Ltd., 1953. 72*s*.

Included in the 19 chapters of this treatise, described in the preface as the outgrowth of a course on viruses which the author has been giving since 1946, first at Indiana University and more recently at the University of Illinois, are numerous references to plant diseases of virus origin. Among the subjects discussed are the detection and identification of viruses; their titration; size and morphology of virus particles; purification and chemical composition of virus material; serological

properties of viruses; environmental effects on virus particles; virus-host interaction, the bacteriophage-bacterium system; the interaction of plant viruses with their hosts; interference phenomena in virus infections; variation in viruses—host variation and susceptibility to viruses; transmission, vectors, and survival; viruses and tumours; and origin and nature of viruses.

GRYLLS (N. E.). **Rugose leaf curl—a new virus disease transovarially transmitted by the leafhopper Austroagallia torrida.**—*Aust. J. biol. Sci.*, 7, 1, pp. 47–58, 4 pl., 1954.

In work at Canberra, Australia, the leafhopper *Austroagallia torrida* was found in considerable numbers in fields containing lucerne witches' broom virus, and in the course of attempts to establish a colony of the insects on *Datura tatula* mild virus symptoms developed. Further collections were made from a lucerne field, and disease symptoms differing from those of any virus disease previously described appeared on a number of plants on which the insects were fed. Later, the same disease was obtained from *A. torrida* collected from Hawkesbury Agricultural College, Richmond, New South Wales. Further experiments showed that the virus, for which the name 'rugose leaf curl' is proposed, was transmitted through the eggs of the leafhopper. In greenhouse tests the following plants in addition to *D. tatula* were infected by the insect: Rouge de Marmande and Kondine Red tomatoes, *D. stramonium*, *Physalis floridana*, *Nicandra physaloides*, *Malva parviflora*, Chantenay carrot, Hollow Crown parsnip, lucerne, *Medicago lupulina*, clover (*Trifolium pratense*), *Crotalaria* sp., *Sonchus oleraceus*, *Urtica urens*, *Polygonum aviculare*, and *Sanguisorba minor*.

The most characteristic symptoms included severe rugosity, twisting, and curling of the leaves, and marginal chlorosis. In addition, vein-clearing or netting, interveinal chlorosis, shoot proliferation, and stunted flowers were present on various hosts. Anatomical studies of the stems of diseased tomato and *Physalis floridana* indicated that the virus affects the phloem. The disease was not transmitted mechanically or by *Cuscuta campestris*, but it was transmitted by grafting. It was not observed in the field.

MARINI (ENRICA). **Organizzazione e ricerche per il controllo della produzione di Patate da seme in Francia.** [Organization and researches for the control of the production of seed Potatoes in France.]—*Ann. Sper. agr.*, N.S., 7, 5, pp. xi–xv, 1953. [English summary.]

In France the serological method is used on a very large scale as a basic technique in the study of plant virus diseases [*R.A.M.*, 29, p. 138; 32, p. 470, *et passim*]. The sera are prepared in liquid form for immediate use and in powder form (lyophilized) for storage purposes. Certain commercial firms specialize in the production of sera of potato and dahlia viruses; they are directed by experts assisted by specialist technicians, and work in close collaboration with the Central Station of Plant Pathology, Versailles. The sera are supplied to the seed-potato growers' co-operative societies, which have expert staffs capable of undertaking research, and to large-scale dahlia growers. The Central Station tests all sera produced in France before they are released for commercial use. As a result of this collaboration there has been a great improvement in seed potato production in the last few years.

In Italy work on these lines has already been initiated by the Plant Pathological Laboratory and the Phytopathological Observatory, Milan.

List of intercepted plant pests, 1953.—*S.R.A., Bur. Ent., Wash.*, 69 pp., 1954. [Received January, 1955.]

The following (besides a number of incompletely determined species) were among the pathogens, apparently not previously established or widely distributed in the

United States, which were intercepted on air-borne plant material entering the country between 1st July, 1952, and 30th June, 1953 [cf. *R.A.M.*, 33, p. 522]: *Cercospora pini-densiflorae* on Japanese white pine from Japan; *Coniothyrium hellebori* on Christmas rose [*Helleborus niger*: 34, p. 370] from Holland; *Cryptospora longispora* on Norfolk Island pine [*Araucaria excelsa*] from New Zealand [33, p. 522]; *Puccinia horiana* on *Chrysanthemum morifolium* and *C.* sp. from Japan [cf. 13, p. 656]; *Urocystis gladiolicola* on *Gladiolus tristis* [cf. 32, p. 483] in mail from the Republic of Ireland; *Xanthomonas citri* [C.M.I. map No. 11; *R.A.M.*, 33, p. 522] from the Truk Islands [Caroline Islands]; *Gymnosporangium haraeanum* on Chinese juniper (*Juniperus chinensis*) and *J.* sp. from Japan; *G. sabinae* on *J. chinensis* [var.] *pfitzeriana* [cf. 31, p. 191] from Germany; *G. yamadae* on apple from Japan [cf. 14, p. 533]; *Phakopsora desmium* on cotton from the Dominican Republic [cf. 32, p. 422; C.M.I. map No. 258]; *Sphaceloma fawcetti* var. *scabiosa* on lemon from Australia [*R.A.M.*, 33, p. 522] and New Zealand; and *Thecopsora areolata* on spruce from Norway [15, p. 618].

Chrysomyxa rhododendri was intercepted 13 times on *Rhododendron ferrugineum* from Switzerland [loc. cit.] and once from Austria, twice on *R.* sp. from Switzerland and once on *R. azaleodendron* from England. Of the 107 lots of material harbouring *Elsinoe australis* on sweet, sour, and mandarin oranges, lemon, and sour lime [C.M.I. map No. 55], 42 were from Argentina, 57 from Brazil, one from Paraguay, and one from Uruguay [*R.A.M.*, 33, p. 522].

Thirty-fourth Report of the National Institute of Agricultural Botany, Cambridge, 1953.—48 pp., 1953. [Received 1954.]

In the mycology section (pp. 18–19) of this report [cf. *R.A.M.*, 33, p. 204] it is stated that wheat yellow rust [*Puccinia glumarum*: loc. cit.] appeared late in the season and was mainly slight. The distribution of races was similar to that in previous years except that race 5 was not found in southern Scotland.

The existence in Great Britain of several physiologic races of wheat loose smut [*Ustilago tritici*: loc. cit.] has been confirmed. Many wheat varieties appear to be highly resistant to all races.

Preliminary results indicate that there are differences in varietal reaction of wheat to eyespot [*Cercosporella herpotrichoides*: 33, p. 76].

Of 62 samples of celery seed tested (p. 31) for leaf spot [*Septoria apii-graveolentis*: 33, p. 205], 35·3 per cent. were uninfected, 41·9 per cent. had up to 5 per cent. infection, and the rest 5 to 60 per cent.

Šutić (C.) & Klijajić (R.). **Prilog poznavanju parazitne flore Deliblatske Peščare.** [A contribution to the knowledge of the parasitic flora of Deliblatska Peščara.] —*Zasht. Bilja* [*Plant Prot., Beograd*], *1954*, 24, pp. 104–108, 1954. [English summary.]

In May, 1953, during a disease survey of Deliblatska Peščara, Yugoslavia, *Clasterosporium carpophilum* was frequently observed on cherries [*R.A.M.*, 31, p. 353] and was very severe on peaches [31, p. 594]. A severe attack of *Fusarium* sp. on pine (*Pinus nigra*) [32, p. 458] caused serious damage in the Forestry Management Nurseries at Banatsko Rankovićevo. *Gloeosporium morianum* was also serious in this district, causing complete withering of lucerne leaves in one field. *Marssonia* [*Marssonina*] *juglandis* was regularly noticed in exceptional intensity on walnut leaves and petals. *Peronospora parasitica* on cabbage [cf. 33, p. 437] and *P. schleideni* [*P. destructor*] on onion were both fairly serious at Banatsko Rankovićevo. *Septoria tritici* was severe on wheat [30, p. 507] and *Puccinia graminis* was common on leaves and shoot tips of barberry [cf. 33, p. 521], which is very widespread. *Mycosphaerella fragariae* on strawberry [C.M.I. map No. 110] was also recorded.

Fungoid diseases of crops and their remedies.—*Mysore agric. Cal., 1952–1953*, pp. 41–46, 1952. [Received 1954.]

Notes are given on crop diseases in Mysore, India, including koleroga of areca palm (*Phytophthora arecae*) [*R.A.M.*, 32, p. 211]; anabe-roga of areca and coco-nut palms caused by *Ganoderma lucidum* [21, p. 252]; early blight (*Alternaria solani*) [33, p. 711 and next abstract] and ring disease (*Bacillus* [*Pseudomonas*] *solanacearum*) [loc. cit.] of potato; and *Sclerotium rolfsii* causing root rot of apple [cf. 33, p. 282].

Mysore Agricultural Calendar and Year Book, 1954.—176+xxxi pp., 13 figs., 1 graph, Bangalore, Modi Power Printing Works, 1954. 8 annas.

S. Venkatarayan (pp. 131–133) contributes notes on the rice blast (*Piricularia oryzae*) [*R.A.M.*, 33, p. 112; 34, p. 175] and its control. In India some resistance has been observed in the varieties S. 139, S. 705, S. 625, S. 199, S. 718, S. 749, H. 294, B. 1399, H. 497, Musalli, Togarina, Walya, Honasu, and B. 281, and in crosses of S. 1088 with S. 1092 and of S. 269 with S. 1073 and S. 1079.

Seedling blight of *Eleusine coracana*, caused by *Helminthosporium nodulosum* [26, p. 393], is described by N. S. Venkatakrishniah (pp. 133–134). All cultivated varieties are susceptible. Control may be effected by seed treatment with agrosan GN, ceresan, or fermate.

Popular local notes on new fungicides and their application are contributed by N. S. Venkatakrishniah (pp. 134–136).

The major diseases of the chief cash crops in Mysore, their symptoms, prevention, and control, are outlined by N. S. Venkatakrishniah (pp. 137–143). These include *Colletotrichum falcatum* [*Physalospora tucumanensis*: 33, pp. 633, 710], *Hendersonina sacchari* [18, p. 307], *Ustilago scitaminea* [33, p. 633], *Cercospora longipes* [cf. 32, p. 669], *Leptosphaeria sacchari* [29, p. 123], and mosaic [virus] disease [33, p. 562] on sugar-cane; *Fusarium vasinfectum* [32, p. 624; 34, p. 226], *Xanthomonas malvacearum* [32, p. 253], *Rhizoctonia* [? *Macrophomina phaseoli*: 30, p. 519], and *Oidium* sp. on cotton; *C. personata* [32, p. 176] and *Sclerotium rolfsii* [33, p. 65] on groundnut; *Bacterium* [*Pseudomonas*] *solanacearum* [C.M.I. map No. 138], *C. nicotianae* [No. 172], damping-off (*Pythium* or *Phytophthora*), *Erysiphe cichoracearum* [*R.A.M.*, 17, p. 295], *S. rolfsii* [cf. 27, p. 47], and tobacco mosaic virus [34, p. 81] on tobacco; *Pseudomonas solanacearum* [see preceding abstract], *Alternaria solani* [loc. cit.], *Corticium vagum* [*C. solani*: 16, p. 231], *F. oxysporum* [loc. cit.; cf. 32, p. 448], and [unspecified] virus diseases on potato; and diseases of chilli and coriander.

Stehlé (H.). **Quelques notes sur la botanique et l'écologie végétale de l'Archipel des Caraïbes.** [Some notes on the botany and plant ecology of the Caribbean Archipelago.]—*J. Agric. trop. Bot. appl.* (formerly *Rev. int. Bot. appl.*), 1, 1–4, pp. 71–110, 1954.

These notes, prepared for presentation at the Eighth International Botanical Congress [Paris], July, 1954, include tabulated synopses indicating the symptoms and severity of the principal crop diseases in the French Antilles (Guadeloupe and Martinique) [the exact locality is not always stated]. On banana; infections include those of the rhizomes and roots caused by *Marasmius semiustus* [cf. *R.A.M.*, 32, p. 324] and *Sphaerostilbe musae* [*Calostilbe striispora*: 4, p. 23; 7, p. 492; 28, p. 31]; of the leaves by *Fusarium moniliforme* [*Gibberella fujikuroi* var.] *subglutinans* [cf. 13, p. 788; C.M.I. map No. 191], *F. culmorum*, and *F. semitectum*; and of the fruits by *Stachylidium* [*Verticillium*] *theobromae* [No. 146], the wound parasite *Lasiodiplodia* [*Botryodiplodia*] *theobromae* [*R.A.M.*, 30, p. 181], and *Gloeosporium musarum* [cf. 13, p. 455; 32, p. 634, *et passim*] and *Piricularia grisea* [cf. 24, p. 7], which affect the fruits after picking.

Among the coffee diseases dealt with are the root- and foot-rots caused by *Rosellinia pepo* [C.M.I. map No. 298], *R. bunodes* [cf. *R.A.M.*, 27, p. 471], *R. coffeicola* [cf. 19, p. 402], and *Sclerotium rolfsii*, and infection of the trunk and branches by *Corticium salmonicolor* [C.M.I. map No. 122].

The mycoses of sugar-cane listed include *Leptosphaeria sacchari* [cf. *R.A.M.*, 34, p. 64], and *Helminthosporium sacchari* [cf. 31, p. 8].

Bacterial diseases include red leaf stripe (*Xanthomonas rubrilineans*) [C.M.I. map No. 39; cf. *R.A.M.*, 33, p. 214] and mottle stripe (*X. rubrisubalbicans*) [cf. 32, p. 339] of sugar-cane, and moko disease of bananas (*Phytomonas* [*Pseudomonas*] *solanacearum*) [cf. 33, p. 282], the last-named organism also causing heavy losses in tobacco, tomato, eggplant, potato, *Ricinus*, and vanilla. Crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*) affects white and yellow yams (*Dioscorea alata* and *D. cayennensis*, respectively), and sweet potatoes. The disease was very severe in 1936, 1945, 1946, and 1951. In 1954 the yields of yams in Guadeloupe was reduced by 60 per cent. as a result of infection in Grande-Terre. Yellow yam varieties are more resistant than white, and among the latter Dominique and Caplaore are particularly susceptible.

Notes are also given on the symptoms of sugar-cane mosaic and chlorotic streak viruses and potassium, nitrogen, phosphorus, calcium, iron, and manganese deficiencies of sugar-cane, and of infectious chlorosis [? cucumber mosaic] virus and nitrogen deficiency on banana.

Patel (M. K.), Kulkarni (Y. S.), & Dhande (G. W.). **Two new bacterial diseases of plants.**—*Indian Phytopath.*, 7, 1, pp. 1–6, 1 pl., 1954.

An expanded account is given of two bacterial diseases caused by *Xanthomonas clerodendroni* on *Clerodendron phlomoides* and *X. sesbaniae* on *Sesbania aegyptiaca*, already noticed in this *Review* [*R.A.M.*, 31, p. 544].

Hudson (J. P.) & Williams (I. H.). **Juvenility phenomena associated with crown gall.**—*Nature, Lond.*, 175, 4462, p. 814, 1 fig., 1955.

At the University of Nottingham School of Agriculture, Sutton Bonington, leaves growing from root cuttings of raspberries in a heated greenhouse exhibited a progressive reversion to juvenility, contrary to the normal growth sequence. All plants with these symptoms were found to bear well-developed basal galls caused by *Bacterium tumefaciens*.

Annual Report of the Department of Agriculture, Gold Coast, for the period 1st April, 1952, to 31st March, 1953.—28 pp., 1954.

In this report [cf. *R.A.M.*, 33, p. 592] it is stated that full-scale cutting out of cacao trees for the control of swollen shoot virus [loc. cit.; 34, p. 353] was resumed in the Gold Coast in September, 1952, since when control has made marked progress. Much lost ground still remained to be made up, however, at the end of the year. Very considerable spread occurred, particularly in the Eastern Province westwards and north-westwards from the area of mass infection, during the many months when little planned or orderly field work was possible.

In Ashanti, initial treatment of outbreaks, 259 of which were discovered in 1952–3, was up to date at the end of the year, when nearly 4,000 farms were under re-inspection and re-treatment as necessary. The equivalent of about 2,750 acres of cacao had been cut out since the beginning of the campaign.

In the Western Region nearly 130,000 acres had been surveyed by March, 1953, 60,000 acres of this re-surveyed, and 678,115 trees (equivalent to about 2,000 acres of cacao) cut out. In the New Deal area of the Eastern Province (the north-western, western, and south-western parts) by the end of the year approximately 720,000 acres had been surveyed and 80,000 acres of this re-surveyed; over 11,000

acres were cut out on 13,000 farms. In the Resumed Area (Subum-Korforidua-Tafo) regular treatment was begun again of the blocks of farms, aggregating over 50,000 acres, which had been treated up to April, 1951, and then abandoned. Initial treatment of more blocks was begun later in the year. Many untreated farms had, however, already been replanted, and swollen shoot virus had spread to the young trees. Since the start of the campaign 12,000,000 trees had been cut out in the course of treating 56,500 acres. In parts of the Abandoned Area (south of the Resumed Area) cacao is dying out and swollen shoot disease is widespread.

In the Trans-Volta and Togoland Region a record crop of 27,909 tons was produced, mostly from the Jasikan district, where no outbreak was discovered up to the end of the year. The Kpene district to the south is of declining importance as a cacao producer, and numerous outbreaks have occurred here; most were being treated by March, 1953, and had required since the beginning of the campaign the cutting out of about 66,000 diseased trees.

Johnson (T.). **International co-operation in the production of rust resistant cereals.** —*Commonw. phytopath. News*, 1, 1, pp. 5–7, 1955.

This is a brief historical survey of exchanges of rust (*Puccinia graminis*)-resistant wheat varieties and of information between Commonwealth countries and between the United States, Canada, and Mexico. This co-operation is quite informal but of great practical importance in obtaining breeding material to combat the new races of *P. graminis* as they appear.

Tsuimbal (M. M.). Мероприятия по борьбе с бурой ржавчиной Пшеницы в степи УССР. [Measures for the control of Wheat brown rust in the steppe of the U.S.S.R.]—Земледелие [*Zemledelie, Moscow*], 3, 1, pp. 100–103, 1955.

According to data from the Ukrainian Scientific Research Institute wheat yields on the Ukrainian steppe are reduced by 30 to 40 per cent. in years when brown rust [*Puccinia triticina*: *R.A.M.*, 33, p. 595] is serious, but sometimes both winter and spring wheat remain free from rust. The wind-borne summer spores of the fungus do not infect winter and spring wheat and thus appear insufficiently adaptable to the conditions and to the varieties grown in the steppe. Overwintering of the uredospores is considered to be a recurrent additional factor, uredosori being present on the lower, semi-wilted leaves of winter wheat in spring.

In trials in the Kirovogradsky region spring harrowing reduced plant infection from 45 per cent. in non-harrowed plots to 10 per cent. and leaf infection from 100 to 20 per cent. In three localities in the Dnepropetrovsk region plant infection in the non-harrowed was 40, 65, and 75 per cent., respectively, and 25, 40, and 75, in the harrowed; leaf infection being reduced from 75, 95, and 100 to 50, 75, and 80 per cent., respectively.

Sowing winter wheat during the optimum period and spring wheat early results in the least amount of infection. Soft spring wheat is more susceptible than hard and should be planted some distance away or with a 200–300 m. space or an intercrop between.

Applications of a complete mineral fertilizer or one of potassium-phosphorus also reduced the infection from 35 (untreated) to 15 per cent. Resistance is particularly increased when wheat is sown along with the granulated fertilizer.

Schroeder (H. W.). **Reaction of spring Wheat varieties and selections to artificial inoculation with loose smut.**—*Plant Dis. Reptr*, 38, 12, pp. 882–886, 1954. [Multilithed.]

At the Minnesota Agricultural Experiment Station in 1953–4, 109 spring wheat varieties and selections were tested for resistance to loose smut (*Ustilago tritici*) [*R.A.M.*, 34, p. 27] by sowing seed from plants inoculated with a mixture of spores

from the area. The following developed no smutted heads in approximately 10 head rows: seven Lee × Mida Sib. hybrids, four of Frontana × Thatcher, Henry × Thatcher–W38–111.1–Hope, Moen (Thatcher selection), two K 58 × Mida-Newthatch hybrids, Newthatch × Frontana, Kenya–Gular–Pilot × K 58–Newthatch, Mida-Newthatch × K 117 A, Hope, Newthatch, Me²–N 1930–17c–2T–9H, K–U 1122–4c–1c–1c-3y–3c–1y, Willet, Redman, Mindum, Carleton, Stewart, Nugget, and Sentry. Up to 91 per cent. infection occurred in some other varieties.

Carter (M. V.). **Additional genes in Triticum vulgare for resistance to Erysiphe graminis tritici.**—*Aust. J. biol. Sci.*, 7, 4, pp. 411–414, 1954.

Further genetic studies were made at the Waite Agricultural Research Institute, Australia, of the resistance of three wheat varieties to races *P* and *P*–1 of *Erysiphe graminis tritici* [*R.A.M.*, 33, p. 289; 34, p. 27]. Separate tests of F_2 samples of Birdproof × Chul at two stages of growth clearly demonstrated the presence in Birdproof of a second gene, Ml_b, not allelic to Ml_s, conferring resistance to both races of the fungus from the three-leaf stage onwards. Chul possesses a single dominant gene, Ml_c, for resistance to race *P*–1 at all stages of growth, and Normandie the Ulka gene, Ml_u, for resistance to both races. These four genes and Ml_t may be used as differentials for the separation of wheat mildew races, and would permit the identification of 32 such races.

Hummel (B. C. W.), Cuendet (L. S.), Christensen (C. M.), & Geddes (W. F.). **Grain storage studies XIII. Comparative changes in respiration, viability, and chemical composition of mold-free and mold-contaminated Wheat upon storage.**—*Cereal Chem.*, 31, 2, pp. 143–150, 2 graphs, 1954.

In further studies at the Minnesota Agricultural Experiment Station [cf. *R.A.M.*, 32, p. 183] the respiratory rates of mould-free Elgin wheat [31, p. 112] stored at 35° C. and moisture-levels ranging from 15 to 31 per cent. were low and constant, whereas those of samples contaminated by *Aspergillus*, *Penicillium*, *Hormodendrum*, and *Oospora* spp. increased markedly after a few days, reaching 1,608 mg. carbon dioxide per 24 hours per 100 gm. dry matter at the maximum moisture-level as compared with 265 for the mould-free. Mould growth also reduced the viability of samples stored at the lower moisture-levels; above 20·2 per cent. even the uninfected ones were non-viable. Mould development was accompanied by heavy increases in fat acidity, which exceeded the equivalent of 170 mg. potassium hydroxide per 100 gm. at the highest moisture-level as compared with 14·1 in the original material, and a fall in non-reducing sugars from 201 to 134 mg. sucrose per 10 gm. at a moisture-level of 19·1 per cent. There were only slight changes in these constituents in the healthy samples.

Minz (G.). **Helminthosporium diseases in Barley.**—*Hassadeh*, 34, 9, pp. 616–618, 1954. [Hebrew.]

Helminthosporiosis of barley is of frequent occurrence in Israel. Most farmers confuse the different diseases caused by the causal agents (*H. gramineum*, *H. teres*, and *H. sativum*), especially stripe and net blotch. Owing to systematic use of seed dressings over a number of years stripe disease has been almost eradicated from the country; net blotch, however, is very prevalent, especially on B.M.C. *H. sativum* is of minor importance but attacks particularly the Nissanit variety, which is relatively resistant to *H. teres*.

In spite of seed treatment secondary infection originates from volunteer barleys, which frequently occur on fallows, mostly after harvesting with combines.

Descriptions of the three diseases, their modes of infection and perpetuation, and cultural and chemical control methods are given in detail.

Sherf (A. F.). **The 1953 crown and stem rust epidemic of Oats in Iowa.**—*Proc. Iowa Acad. Sci.*, 61, pp. 161–169, 1954. [Received June, 1955.]

The widespread epidemic of crown rust (*Puccinia coronata*) [see following abstracts] and stem rust (*P. graminis*) [*R.A.M.*, 34, p. 222] on oats in Iowa in 1953, resulting in 30 and 10 per cent. damage, respectively, was due to a number of factors including the growing of susceptible varieties on most farms, the presence of abundant inoculum of crown rust on *Rhamnus* spp. and stem rust on barberry, the southern winds, and a warm (73·2° F. average temperature), wet June. The oat crop, both in yield per acre and the total production, was the smallest since the dry year of 1934.

Early planting in well-prepared seed-beds of varieties possessing widely different types of genetic resistance and eradication of alternate hosts are recommended.

Bragonier (W. H.). **The relation of Buckthorn to losses from crown rust of Oats.**—*Proc. Iowa Acad. Sci.*, 60, pp. 95–97, 1953. [Received June, 1955.]

Rhamnus cathartica is reported to be largely responsible for the early spring spread of crown rust (*Puccinia coronata*) to oats [*R.A.M.*, 34, p. 222 and preceding abstract] in Iowa. Owing to the return to oat varieties resistant to some but not all the races of the rust, eradication or control of *R. cathartica* under the Iowa Crop Pest Act of 1927 declaring it a pest, is recommended.

In April, 1953, a new rust race caused extensive damage to Victoria-Richland hybrids, which had been resistant for many years [see next abstract].

Simonds (M. D.) & Murphy (H. C.). **Inheritance of resistance to two races of Puccinia coronata Cda. var. avenae. Fraser and Led.**—*Proc. Iowa Acad. Sci.*, 61, pp. 170–176, 1954. [Received June, 1955.]

This information on the inheritance of resistance to races 45 and 101 of *Puccinia coronata* var. [f.sp.] *avenae* in oats [see preceding abstracts] has already been noticed from another source [*R.A.M.*, 34, p. 362].

Hooker (A. L.). **Severity of Corn seedling disease in Iowa soils.**—*Proc. Iowa Acad. Sci.*, 60, pp. 158–162, 1953. [Received June, 1955.]

In greenhouse pot experiments at the Iowa Agricultural Experiment Station in 1952 the severity of maize seedling disease [*R.A.M.*, 27, p. 120], largely due to species of *Pythium* [33, p. 477 and next abstract], was measured in 66 different samples of Iowa soils at 16° and 10° C. and a moisture-level of 60 per cent. water holding capacity, using the susceptible maize hybrid X9180 in both series. A high level of seed decay and root-rotting of seedlings was observed in all soil samples at both temperatures, the severity varying with different soils and cropping sequences. In general, disease incidence was least in the colder series in soils previously cropped with meadow grasses or soybeans and highest in those previously cropped with oats (in particular) and maize. As a rule, root-rotting on mature maize plants was more common in low- than in high-fertility soils, soil fertility influencing the host rather than the pathogenic flora of the soil.

Hooker (A. L.). **Relative pathogenicity of Pythium species attacking seedling Corn.**—*Proc. Iowa Acad. Sci.*, 60, pp. 163–166, 1953. [Received June, 1955.]

At the Iowa Agricultural Experiment Station, the pathogenicity of nine species of *Pythium* to maize seedlings [*R.A.M.*, 33, p. 667 and preceding abstract] was evaluated experimentally. Seeds of the susceptible X9180 and the resistant X5171 strains were sown between $\frac{1}{2}$-in. layers of a mixture containing two-day-old fungus cultures on potato dextrose agar crushed and uniformly mixed with quartz sand, over soil. The pots were then incubated at 10°, 16°, or 24° C. for seven days and removed to greenhouse bench at 24°. The fungus was also established in

freshly steamed sand-peat for two days before sowing, the pots then being kept at 16° or 24°. Moisture content was maintained at 60 per cent. in all.

Most of the species were more injurious to the seedlings at low than at high temperatures. At 10° seed decay, caused by *P. debaryanum* and *P. splendens*, was prevalent, while at 24° root-rotting, produced by *P. graminicola*, *P. paroecandrum*, and *P. arrhenomanes*, was more common. *P. rostratum* and *P. acanthicum* were not highly pathogenic. On X5171 *P. graminicola* was more pathogenic than *P. debaryanum*, while on X9180 the reverse was true. *P. irregulare* and *P. splendens* established themselves readily in soil and were more injurious in the second method.

RADMAN (L.). **Prugava ili stabljikina snijet Raži.** [Stripe or stem smut of Rye.]—*Zasht. Bilja* [*Plant Prot., Beograd*], *1954*, 24, pp. 87–91, 2 figs., 1954. [English summary.]

Stripe smut (*Urocystis occulta*) of rye [cf. *R.A.M.*, 33, p. 428], present in Yugoslavia since 1912 according to N. Ranojević (*Cryptogamic diseases of wheat in Serbia*, Beograd, 1912), is reported for the first time from Hercegovina, where in 1951 and 1952 infection reached 30 per cent. in some fields. The disease was reported to have caused serious damage in Hrvatsko Zagorje in 1948.

STOLL (SIMONE) & BOUTEVILLE (YOLANDE). **Tests micrographiques et chromographiques relatifs à la détection de l'ergot de Seigle et de quelques plantes satellites des céréales.** [Micrographic and chromographic tests for the detection of ergot of Rye and several other plants associated with cereals.]—*Chim. anal.*, *1954*, 2, pp. 33–40, 1 col. pl., 1 fig., 1954.

Owing to the deformation of starch grains by the baking process the presence of ergot (*Claviceps purpurea*) [*R.A.M.*, 34, p. 224] in bread is far less easily detected than in rye flour. Particularly small percentages cannot be ascertained microscopically.

For the detection of ergot in rye bread the authors have made use of the fact that non-polar solvents, like benzene, petroleum ether, and chloroform, instead of extracting the pigment from the vegetable cell, darken its colour, thus simplifying rapid detection. When dried bread is macerated with benzene, preferably acidified with 2 per cent. hydrochloric acid, ergot pigments can be seen with a magnifying glass. With rye flour the purple ergot gave a yellow-red solution, an [unspecified] black smut a yellow one, black vetch [? *Vicia ervilia*] a reddish liquid, and a brownish *Melampyrum* a green tint. The pigments were extracted from the cells with acetone, methanol, or ether plus 1 per cent. hydrochloric acid. Acetone was the most effective as further concentration at 30° C. eliminated the protoplasm adhering to the pigments.

The intensity of the general colour permitted the determination of percentages of ergot between 5 and 0·5 when 2 gm. flour were extracted with 10 ml. acetone plus 1 per cent. hydrochloric acid, and the final volume concentrated to 5 ml. To ascertain ergot contents of 0·1 to 0·25 a test dose of 10 gm. of flour was needed to produce a perceptible colour. The toxic limit of ergot in flour is about 1 per cent.

As a universal tint did not allow very accurate diagnosis, the constituents were separated by paper chromatography. Ammoniacal butanol gave less extended and therefore darker and more accurately measurable colour spots than acetic butanol. The colour changed in daylight when the paper was transferred from the testing jar into the air. It showed best in ultra-violet light, after being intensified with aluminium chloride (1 per cent. solution in ethanol) or alcoholic potassium hydroxide, applied with a paint-brush. A rose colour at the head of the chromatogram indicates the presence of ergot, doses as low as 0·6 mg. pure ergot (corresponding to 2 gm. tainted flour) being detectable with precision.

Chant (S. R.). **Concentric ring blotch of Citrus in Nigeria.**—*Commonw. phytopath. News*, 1, 1, p. 9, 1 fig., 1955.

Citrus concentric ring blotch [*R.A.M.*, 29, p. 89] was recently observed in Ibadan Province, Nigeria, on sweet orange seedlings grown as rootstocks. This appears to be the first record of the disorder from West Africa.

Maistre (J.). **Méthodes rationelles d'amélioration des Caféiers dits 'de basse altitude'.** [Rational methods for the improvement of the so-called 'low-altitude' Coffee plants.] —*Agron. trop., Nogent*, 10, 2, pp. 141–173, 1 pl., 3 figs., 4 graphs, 1955. [English and Spanish summaries.]

The so-called 'low-altitude' coffee species, particularly *Coffea canephora* and *C. excelsa*, used in the East to replace *C. arabica*, which is highly susceptible to *Hemileia vastatrix* [*R.A.M.*, 34, p. 148], are polymorphic varieties yielding beans which, beside other defects, are of widely varying sizes. This polymorphism, due to the essentially allogamic (hybrid) character of these species, cannot be remedied by the usual breeding methods. Seven other methods of improvement are described in detail, involving particularly vegetative propagation: simple monoclones grown without or with pollinators; the establishment of oligoclonal plantations; sexual reproduction after inbreeding; simple and complex crossings of oligoclonal lines; and hybridization with repeated back-crossings. Simultaneous employment of all these methods is recommended.

Verderevsky (D.) & Lukashevich (P.). Новый метод централизованного обеззараживания Хлопковых семян. [A new method of centralized disinfection of Cotton seed.] —Хлопководство [*Cotton Raising*], 5, 5, pp. 35–36, 1955.

A method developed in 1952 at the Moldavian Station of Plant Protection, U.S.S.R., is recommended by the Ministry of Agriculture of the Uzbek S.S.R. for centralized disinfection of cotton seed against gummosis [blackarm: *Xanthomonas malvacearum*: *R.A.M.*, 34, p. 454]. By this method sulphuric acid delinting is followed by rejection of seeds weighing less than one [unspecified] unit, the remaining material being apparently free from infection. This is treated with granosan (7 kg. per 1 t[on] of seed at dry sowing and 4 kg. per ton seed when the seeds are damped with water).

In trials in 1954 in four districts of the Moldavian S.S.R. 635 ha. were sown with delinted seed. Infection was reduced on the average from 80·5 to 11·6 per cent., while the yields were increased from 3·2 to 5·2 z[entner, 1 zentner = 1 cwt.] per ha. In the Uzbek S.S.R. the general infection percentages at the time of flowering in 1953 and 1954 were none and 0·1, respectively, for seedlings from delinted seeds, the corresponding figures for those from non-delinted seed being 1 and 9·1 per cent. Yield per ha. was increased in 1953 from 22·4 to 33·1 zentner and in 1954 from 42·2 to 47·9.

Annual Report of the Jute Agricultural Research Institute (1953–54).—145 pp., 1955.

Chapter VII (pp. 73–81) of this report [cf. *R.A.M.*, 33, p. 722] deals with jute diseases in Bengal, India. Records of foliar infection by *Macrophomina phaseoli* from over 6,000 plants of different varieties of *Corchorus capsularis* confirmed previous observations as to the localization of the pathogen on the basal leaves. In a laboratory study on the pathogenicity to an improved strain of *C. olitorius* of eight forms of *M. phaseoli*, form B–43 from *C. olitorius* proved highly virulent at the seedling stage, while B–59, the agent of epiphytotic root rot, also from the same host, caused wilting mostly of older plants; it was more harmful than B–11 and

N–45 from *C. capsularis*. It would appear that at least three physiologic races of *M. phaseoli* exist in different areas. The epidemiology of root rot, a serious local problem, remains obscure.

Seed treatment with agrosan GN gave good control of seed-borne infection by *M. phaseoli* and protected seedlings to some extent against secondary invasion from the soil, which was also combated by Bordeaux mixture and perenox. A spacing of 3 by 12 in. was found to be the most suitable from a prophylactic standpoint; a greater number of plants with compensating additional nitrogenous fertilizer increased the severity of infection.

All known types of *C. olitorius* are immune from infection by the species of *Colletotrichum* causing anthracnose, but *Corchorus capsularis* falls into four groups representing varying degrees of susceptibility from severe damage in the early stages of growth to localized infection of the ovary or immature capsules. Cortical disintegration of the stem yields a 'specky' product which fetches a comparatively low price. The *Colletotrichum* was shown to be seed-borne, hyphae having been detected in the inner portions of the endosperm, in the cotyledons, and in the testa; it differs from *C. capsici*, reported as a pathogen of jute in Malaya [33, p. 524].

In a study of the highly complicated problem of chlorosis, grafts were made by the inarch and cleft methods between chlorotic and non-chlorotic jute plants and vice versa. The chlorotic stock transmitted the condition to the healthy scion and conversely, with slight delay in the latter case.

In chapter IX (pp. 88–90), dealing with the jute pest and disease control scheme at Tarakeswar, a gradual decline in the incidence of root rot as a result of improved cultural methods is reported, the maximum percentage in 1953 being 11·9 compared with over 40 in 1950. In addition to *M. phaseoli*, species of *Fusarium* and bacteria were implicated to an important extent in the etiology of the disease.

A section (pp. 105–107) of chapter X on substitute fibres is concerned with diseases. *Hibiscus cannabinus* is susceptible to two viruses, one of which causes a severe form of epiphytotic chlorosis; partial resistance was shown by the pigmented types. A strain of *Rhizoctonia* isolated from rotted stems of *H. cannabinus* was pathogenic to jute and is assumed to be identical with *R. bataticola* [*M. phaseoli*]. The leaves and sometimes the stems of the same host were attacked by *Phoma sabdariffae* [cf. 33, p. 481], while other pathogens include *Helminthosporium* sp., a *Volutella* causing brown rot, and *Cercospora hibisci* [cf. 30, p. 389]. A new disease, associated with foliar infection by species of *Curvularia* and *Alternaria*, was observed in ramie [*Boehmeria nivea*] plots.

In addition to the foregoing, other sections of the report contain scattered references of phytopathological interest.

McConaghy (S.). **'Braid Valley' disease of Flax.**—*Res. & exp. Rec. Minist. Agric. Nth. Ireland, 1952*, pp. 21–24, 4 pl., 1954.

Experimental work carried out from 1944 to 1946 indicated that Braid Valley disease of flax in Northern Ireland [*R.A.M.*, 28, p. 215] is not caused by a mineral abnormality but by a soil-borne infectious agent which produces the most severe effects on soils rich in lime.

Hellmers (E.). **Bacterial wilt of Carnations.**—*Gdnrs' Chron.*, Ser. 3, 137, 3567, p. 194, 2 figs., 1955.

In October, 1953, carnation cuttings affected by *Pseudomonas caryophylli* [*R.A.M.*, 34, p. 369] were received in the Department of Plant Pathology of the Royal Veterinary and Agricultural College, Copenhagen, Denmark, constituting a new record for the country. There were two distinct syndromes. One, observed chiefly in propagating beds, developed rapidly from an initial abnormal twisting or curling of the youngest leaves to wilting and grey-green discoloration of the plant.

and root decay. In older plants the disease tended to develop more slowly from slight stunting and occasional longitudinal splitting at the stem internodes to disintegration of the roots and vascular bundles accompanied by brown, sticky exudation inside the bark. Healthy cuttings may be obtained from the tops of plants affected by the latter form. Since the disease was also found in plants imported from Sweden, Germany, Holland, and America it was felt necessary to find some means of detecting diseased cuttings. A method that is simple, inexpensive, and so far 100 per cent. safe was developed as follows. The bases of the cuttings were surface-sterilized for about 30 seconds with 1 per cent. mercuric chloride, washed in 70 per cent. alcohol plus 1 per cent. 8-hydroxyquinoline sulphate, and the waxy covering of the stems rubbed off with this solution and a piece of gauze. The alcohol was then burned off, 5 to 10 mm. of the stem removed aseptically and discarded, and three or four pieces, 2 to 4 mm. long, placed in a numbered test tube containing 5 ml. Difco broth plus 1·5 per cent. glucose and incubated 28° C., the rest of the cutting being placed in another tube of water bearing the same number. After a few days all the cuttings having bacterial or fungal growth in their corresponding broth tubes were discarded and those shown to be healthy were planted. So far, of 15,000 cuttings tested in a Copenhagen nursery none has developed wilt.

Weber (F.). **Ist die Panaschierung des 'Zimmeräonium' eine Virose?** [Is the variegation of the 'indoor Aeonium' a virosis?]—*Öst. bot. Z.*, 101, 5, pp. 498–501, 3 figs., 1954.

The epidermal and capillary cells of the so-called 'indoor Aeonium' (*Aichryson* [*Sempervivum*] × *domesticum* f. *foliis variegatis*) at the Institute of Plant Physiology, Graz, Austria, were found to contain numerous cytoplasmic X-bodies of the type characteristically associated with virus infection [cf. *R.A.M.*, 34, p. 455]. Foliar variegation in these plants is considered, therefore, to be the expression of a virosis.

Smith (J. D.). **A disease of Poa annua.**—*J. Sports Turf. Res. Inst.*, 8, 30, pp. 344–353, 4 pl. (between pp. 434 and 435), 10 figs., 1954.

Poa annua on a cricket pitch in Birmingham in November, 1953, and in two localities at Morton, Keighley, Yorkshire, in April and December, 1954, was affected by a disease producing leaf yellowing, starting at the tips in the older leaves and spreading from the base upwards in the central leaf which finally turns red. The roots and bases of the shoot and leaf sheaths turn black, and the shoot detaches easily. The infected growing point also appears dark through the sheaths and there are no inflorescences on severely infected plants. The root systems are generally poor, with runner hyphae, but new roots, apparently produced after infection, are often quite healthy. Leaves of plants in a later stage of disease have narrow dark lines and minute patches on both surfaces and eventually rot away.

The blackened shoot bases bear dark brown hyphae and sclerotial masses, and stromatal masses occur on the sheaths and leaf blades. The truncate-conical, unbranched conidiophores are 10 to 20 μ long and 4 μ wide at the base, and the fusoid, curved, hyaline spores measure 19 to 32 by 3 to 6 μ in nature and 22 to 35 by 4 to 7 μ on a glucose-yeast extract medium. The optimum growth temperature on this medium is 22° C. The fungus is tentatively identified as *Colletotrichum* sp.

Seedlings of *P. annua* raised from sterilized seed were infected by planting them in an agar medium bearing a culture of the fungus. In the soil infection appears to initiate at or near soil level. A main stem may be infected from an adventitious root, or a root by way of the vascular tissues of the shoot. The leaf sheaths and leaves are probably infected from spores produced on tissues near soil level and by hyphae growing upwards. Numerous appressoria occur on the epidermis of infected shoots near the stromata and germinated on water agar, sometimes producing secondary appressoria.

Smith (J. D.). **Dollar spot disease—fungicide trials, 1954.**—*J. Sports Turf Res. Inst.*, 8, 30, pp. 439–444, 1 pl. (between pp. 434 and 435), 1954.

During 1954 preliminary trials were conducted at the Sports Turf Research Institute, Bingley, Yorks., to compare the relative efficiency of various British and American fungicides in the control of dollar spot of *Festuca rubra* caused by *Sclerotinia homoeocarpa* [*R.A.M.*, 32, p. 629]. Sprays were applied with a motor compressor through a Bray 000 ceramic-tip nozzle at 20 lb. per sq. in. and the dusts broadcast by hand. Inoculum was broadcast evenly, and the plots covered with hessian.

The first experiment, intended as a trial of preventives, begun on 4th October, was complicated by a severe natural infection before the fungicides were applied. Nevertheless, all the materials except tersan 75, viz., verdasan (2 gm. per 25 sq. ft. and 250 ml. water), merfusan (20 gm., dry), experimental fungicide 12 (0·9 gm. in water), antimucin MG (1), krominate (0·2), puraturf 177 (0·75), and calocure (1) reduced the incidence markedly as compared with the untreated controls. In the curative experiment inoculum was broadcast on 21st September and three fungicide applications were made, the first on 8th October. Of the fungicides of British origin antimucin MG (28·75 gm.) was the most effective (average of 5 per cent. infection in November against 16·8 in the control) and caused hardly any scorching, while of the American materials calocure (2 gm.) was the most effective with 8·8 per cent. infection followed by krominate (0·35 gm.) with 11·8 per cent. The untreated plot still had 25 per cent. infection.

Smith (J. D.). **Fusarium patch disease—fungicide trials, 1954.**—*J. Sports Turf Res. Inst.*, 8, 30, pp. 445–447, 1954.

Further trials on the control of *Fusarium* patch disease of turf caused by *F. nivale* [*Calonectria graminicola*: cf. *R.A.M.*, 33, p. 428] were conducted at the Sports Turf Research Institute, Bingley, Yorks., during 1954. On 30th September three blocks of plots were inoculated and covered until 12th October when they were first sprayed. A second spray was applied on 21st October and a third to blocks 1 and 3 on 1st November and to block 2 on 3rd November. A final disease reading was taken on the 19th.

The most satisfactory results were obtained with experimental fungicides 5 (4 gm. per 25 sq. ft. and 250 ml. water) and 12 (1 gm.) in block 1 (average of 4 and 6 per cent. disease, respectively; 10·5 in the control); Bordeaux malachite XTRA (1·25 gm.), malachite green/Bordeaux mixture (250 ml.), and merfusan (40 gm. dry) in block 2 (4, 3·5, and 8 per cent. as against 20·5); and antimucin MG (2 gm.) in block 3 (3·1 per cent. as against 20).

Smith (J. D.). **Turf disease notes, 1954.**—*J. Sports Turf Res. Inst.*, 8, 30, pp. 448–450, 1 pl., 1954.

Ophiobolus disease [*O. graminis* var. *avenae*: *R.A.M.*, 33, p. 428] was common on golf fairways, cricket outfields and squares, and on lawns, in Great Britain, particularly under acid conditions in industrial areas. Repeated applications of a proprietary organo-mercury turf fungicide [unspecified] to the infected areas gave an encouraging degree of control.

New Zealand brown top (*Agrostis tenuis*) at the Sports Turf Research Institute, Bingley, Yorks., was attacked by *Fusarium culmorum* [27, p. 241]. In a small trial control was secured by two applications of ammonium phosphate (9 gm.) and Cheshunt compound (14 gm.), both in 2·25 l. water per sq. yd. The fungus was also isolated from patches of young New Zealand Chewing's fescue (*Festuca rubra* ssp. *commutata*) at Harrogate. Satisfactory control and recovery resulted from applying ammonium phosphate at $\frac{1}{3}$ oz. to $\frac{1}{2}$ gal. water per sq. yd. to the affected patches [cf. 27, p. 136].

Roach (F. A.). **Some observations on the occurrence and correction of nutrient deficiencies in fruit trees and bushes.**—*N.A.A.S. quart. Rev., 1953*, 20, pp. 363–368, 1953.

Notes on mineral deficiencies, including copper, zinc, and nitrogen, observed on fruit trees [cf. *R.A.M.*, 32, p. 133] in south-western England since 1950 are given together with instructions for correcting these disorders.

Kristensen (H. R.). **Frugttrævirosen i Danmark.** [Fruit tree viroses in Denmark.] —*Nord. JordbrForskn.*, 36, pp. 305–309, 1954.

Flat limb virus disease has been observed on 13 varieties of apple in Denmark [*R.A.M.*, 31, p. 172], of which Graasten is the most severely attacked. The disease occurs on both ungrafted and grafted trees growing under a wide range of environmental and nutritional conditions, among the stocks affected being E[ast] M[alling] IV, IX, and XVI. In the course of experiments conducted between 1948 and 1953 in 13 localities on a total of 129 trees and a smaller number of IV and IX stocks, flat limb was transmitted by grafting from diseased to healthy Graasten, and to Bodil Neergaard, and Ildröd [Flame-Coloured] Pigeon. The new growth from 38 out of 39 infected Graasten scions grafted on stocks of 10 healthy varieties developed symptoms of flat limb, but the stocks were not involved. The incubation period ranged from six months to more than five years. Symptoms appeared in three out of four IX stocks grafted with infected Graasten scions, while 23 out of about 30 bud-inoculated from diseased trees contracted the virosis a year later. In tests in which grafts of Ingrid Marie and Höve Pippin were inserted between diseased stocks and healthy scions of Graasten, the latter developed faint but unmistakeable symptoms while the inter-stocks remained free from symptoms.

A graft-transmissible disease, probably caused by peach line-pattern virosis virus, affects 27 plum varieties [34, p. 347], being apparently most prevalent on Victoria.

Apricot mosaic, which is chiefly observed on the Nancy peach-apricot variety, may develop either as an oak-leaf pattern or numerous irregular, ring-shaped, yellow to white lesions distributed over the whole leaf surface; sometimes the two types appear concurrently. It is attributed to peach mosaic virus [cf. 30, p. 20] and is transmissible by grafting. Seven peach varieties are subject to infection by a virus which may be either peach line-pattern virosis or peach mosaic. Mosaic symptoms consisting of yellowish, more or less circular spots, coalescent in cases of severe infection, have been observed on seven cherry varieties. The Früheste der Markt cherry has shown symptoms reminiscent of rasp leaf [34, p. 347], and two sweet cherry varieties are affected by a form of ring spot exactly like tatter leaf [cf. 33, p. 68].

Dalbro (S.) & Nielsen (G.). **Nogle sprøjtemidlers virkning på Æbletræers vækst og fotosyntese.** [The effect of some spraying preparations on the growth and photosynthesis of Apple trees.]—*Tidsskr. Planteavl*, 58, 4, pp. 657–682, 1 fig., 3 diags., 3 graphs, 1955. [English summary.]

In greenhouse experiments in 1951 and 1952 at the State Experiment Station, Blangstedgaard, Denmark, three fungicides used against apple scab [*Venturia inaequalis*: *R.A.M.*, 34, p. 156] were applied to one-year-old Cox's Orange Pippins on M[alling] IV stocks grown in concrete beds with nine replications of single-tree plots. The schedules comprised 12 applications of Bordeaux mixture (the first at 2–1–100, the second at 1–1–100, and the remainder at 0·5–1–100); lime-sulphur beginning at 2 per cent. and thereafter at 1 per cent.; and 1 per cent. midol special merkuri [34, p. 157].

None of the treatments caused leaf scorch, but Bordeaux significantly reduced shoot growth in both years (average aggregates of 167 and 423 cm. per tree in

comparison with 254 and 467 for the water-sprayed, respectively), and lime-sulphur acted similarly but less strongly in 1951 (184 cm.). All the fungicides caused substantial decrease in stem diameter increments, which were 65, 83, and 81 per cent. of the controls for Bordeaux, lime-sulphur, and midol, respectively; the corresponding shoot weight figures were 64, 81, and 83, and the total weight increments per tree 60, 83, and 81. In 1951 all the sprays significantly reduced the average number of leaves per tree, which were 106, 99, and 111 for the three treatments, respectively, as against 125 in the controls; in 1952 only Bordeaux caused any loss. The leaf dimensions were materially reduced by all the fungicides in 1951, when the proportional figures for Bordeaux, lime-sulphur, and midol were 60, 64, and 76 per cent. of the controls. In 1952 the decreases for Bordeaux and midol were smaller (83 and 84) and for lime-sulphur insignificant.

Relative photosynthesis was assessed by means of a portable apparatus containing radio-active carbon, described in *Tidsskr. Planteavl*, 58, pp. 551–556, 1955. In cloudy weather in October, 1951, there was a significant reduction in the Bordeaux-treated trees (77 per cent. of the control), while smaller decreases were registered on a sunny day in 1952 for Bordeaux and lime-sulphur (85 and 89). The generally more injurious influence of the sprays in 1951 is attributed to the simultaneous occurrence of magnesium deficiency [*R.A.M.*, 29, p. 248] in that year.

In the field in 1952 two-year-old Cox's Orange on M IV and Jonathan on M XVI in plots containing six trees each, with five replications, were sprayed six times with the same materials as used in the glasshouse, with the addition of thiovit at 0·75 per cent. for the first treatment and subsequently at 0·5 per cent. The only significant reductions in shoot increments were caused by Bordeaux mixture (84 per cent. in Cox's Orange and 79 in Jonathan). Growth in stem diameter on Cox was decreased by Bordeaux mixture (76) and lime-sulphur (89), and slightly by the former on Jonathan (92), whereas midol and thiovit exerted a stimulatory effect (104 and 108, respectively). Bordeaux was also responsible for severe leaf scorch, while lime-sulphur induced a drop in photosynthesis from 100 to 83 (average of four tests).

The principles and application of a photo-electric apparatus for the measurement of leaf area are explained. It gives approximately the same results as other methods and is more expeditious and convenient.

Martin (D.), Lewis (T. L.), & Cerny (J.). **The physiology of growth in Apple fruits. VII. Between-tree variation of cell physiology in relation to disorder incidence.**—*Aust. J. biol. Sci.*, 7, 3, pp. 211–220, 3 graphs, 1954.

In work carried out in 1951–2 at the Tasmanian Regional Laboratory, Hobart, to elucidate the relationship between mean fruit size per tree and breakdown incidence in apples kept in storage, morphology and physiology were studied in relation to the incidence of disorders in the fruits from an exceptionally uniform plot of 35 30-year-old Jonathans.

A high degree of correlation was established between the variables. For fruits with mean fresh weights of 83·7, 91·5, 95, 98, 100·6, 102·5, 105, 108·4, and 112·7 gm. the incidence of [physiological] breakdown was, respectively, 10·9, 15·7, 59·7, 39·5, 35·6, 49·7, 35, 46·6, and 69·8 per cent.; the corresponding figures for incidence of [unspecified] rots in store were 0·9, 2·3, 1·8, 6·2, 5, 4·8, 7·3, 6, and 6·8 per cent.; for the number of cells per gm. 505, 496, 700, 489, 485, 448, 463, 406, and 418; for the respiration per unit of protein 112, 125, 127, 157, 143, 168, 136, 172, and 163 mg. $\times 10^{-3}$ carbon dioxide per hour; and for the incidence of Jonathan spot [*R.A.M.*, 33, p. 360] 17·2, 36·5, 14·6, 18·1, 15·9, 44·9, 21·2, 32·7, and 16·7 per cent.

From these results it is concluded that the correlation established between mean fruit size per tree and percentage breakdown provides further evidence for the accuracy of this character as an index of susceptibility. The correlation of cell size and disorder incidence supports the view that variations in disorder level

may be related to difficulties of cell organization associated with cell growth. The correlation between respiration per unit of protein, determined before storage, and disorder incidence after seven months' storage increases the likelihood that disorder incidence may be determined by difficulties in protein maintenance, the differences in respiration rate per unit protein over the storage period determining the relative depletion of reserves and the extent of breakdown. Though a positive correlation was established between the percentage of [unspecified] rots apparent when the apples were removed from store and mean fruit size, it gradually became insignificant after transfer to room temperature. This relationship has not been noted previously, and should be considered in all experiments on rotting in which different populations of fruit are compared. A complex relationship, not reported before, was established between Jonathan spot and breakdown, in that while there was a negative correlation between the two disorders between trees, there was more fruit with joint symptoms than would be expected by chance.

Goodman (R. N.). **Fireblight control with sprays of agri-mycin, a streptomycin-terramycin combination.**—*Plant Dis. Reptr*, 38, 12, pp. 874–878, 1954. [Multilithed.]

In nine commercial orchards in Missouri in 1954 agrimycin (15 per cent. streptomycin and 1½ per cent. terramycin) at 25, 50, and 100 p.p.m. was tested for the control of fireblight (*Erwinia amylovora*) on Jonathan apple trees [*R.A.M.*, 34, pp. 97, 378]. Two to four sprays were applied in April and May with a speed sprayer in all localities except Boonville, where a single-nozzle hand gun giving a pressure of 600 lb. per sq. in. was used. All the treatments reduced infection considerably, the number of blighted blossom clusters per tree (primary infection) ranging from 0·2 to 10 and of shoots (secondary infection) from 1·3 to 55, the corresponding figures for the trees sprayed with water only being 7 to 55 and 30 to 244. There was little difference in control between the four- and three-spray programmes at either 50 or 100 p.p.m., and the trees receiving these treatments remained relatively free from secondary blight for 30 days after the first primary infection. The four-spray schedule at 25 p.p.m. was also highly effective.

No adverse effect was observed on the fruits, even after six in-bloom and post-bloom sprays at concentrations up to 100 p.p.m., but slight marginal chlorosis of the leaves sometimes developed after four sprays at 100 p.p.m. and to a lesser extent at 50 p.p.m.

Siebs (E.). **Untersuchungen über die Schorfresistenz von Birnen (II). Blattschorf-resistenzprüfung an Sortennachkommenschaften. (III). Stofflicher Hinweis auf die Grundlagen der Blattschorfresistenz.** [Studies on the scab resistance of Pears (II). Leaf scab resistance tests on varietal progenies. (III). A metabolic clue to the bases of leaf scab resistance.]—*Phytopath. Z.*, 22, 4, pp. 437–448, 1954; 23, 1, pp. 37–48, 2 figs., 1955.

Twelve pear varieties were given up to six inoculations with conidial populations of *Venturia pirina* and kept under observation during the period from 1947 to 1949 at the Max Planck Plant Breeding Institute, Voldagsen, Western Germany [*R.A.M.*, 32, p. 196 and next abstract]. The seedlings of the following varieties showed little more than 30 per cent. scab resistance: Flaschenbirne, New Poiteau, Early Trévoux, Grüne Jagdbirne, and two unnamed varieties, VI and III, which, according to observations made over five years in the field, were not entirely free from scab. In 1950, after renewed inoculations, selections were made which were 94 per cent. resistant. However, of the 2,050 seedlings arising from this material only 2 per cent. were free from the disease.

Seventeen monosporic strains of the pathogen from four sources varied in their pathogenicity to the parent varieties as well as to cloned seedlings selected as

resistant; on the latter, however, only one strain, in one case, was highly virulent, and no strain was pathogenic to all test plants. Grüne Jagdbirne, the least severely affected by the four fungus sources, yielded the most virulent monosporic strains; on an average, however, the strains were 11 per cent. pathogenic on the clones. The percentage of resistance was significantly higher in the clones (71 per cent., with two clone groups and a number of single clones completely resistant) than in the parent trees. This was confirmed in the following year by inoculation with five strains of *V. pirina* from severely affected varieties to clones which were not weakened by transplanting.

It is concluded that even amply tested seedling selections resistant to leaf scab can still be attacked by individual moderately virulent biotypes, but that highly virulent races of the pathogen capable of overcoming the resistance are not likely to appear with any frequency on this material even in a district which is favourable to the fungus.

The full extent of the resistance of these selections will, however, only be known after the clones have been tested for fruit scab resistance.

The glycoside arbutin, tannins, and hydroquinone were tested for their action on the fungus in a synthetic nutrient solution. Arbutin was tolerated even at the high concentration of 1 in 500. The tannin content of pear leaves is relatively low and extracts, except pyrocatechol, which largely suppressed growth, exerted little or no fungistatic effect. The foliage of resistant varieties, e.g., Grüne Jagdbirne and Early Trévoux, was richer in hydroquinone and possibly in other free phenols than that of susceptible ones, such as Solaner and Graf Moltke. Even at 1 in 1,000 hydroquinone inhibited the growth of the pathogen almost completely, while at 1 in 500 there was no development. Although arbutin itself is not fungistatic, its presence in pear leaves is regarded as important, since it can be split by hydrolysis into hydroquinone and glucose and the hydroquinone content is therefore controlled by its formation and decomposition [cf. **33**, p. 432].

Perišić (M. M.). **Šarka Šljive u srezovima radjevskom (Krupanj) i jadranskom (Loznica).** [Plum pox disease in the Krupanj and Loznica districts.]—*Zasht. Bilja* [*Plant Prot., Beograd*], *1954*, 24, pp. 98–103, 1954. [French summary.]

A survey carried out in July, 1953, on the spread of plum pox disease [*R.A.M.*, 34, p. 463] in western Serbia, Yugoslavia, suggested that the disease was introduced into the Loznica district some 30 years ago and from there into the Krupanj region in 1936 on infected planting material from neighbouring nurseries, infection being more severe in orchards nearer to the nurseries. The disease is not soil-borne and the part played by aphids (*Anuraphis padi*) in transmitting the disease was insignificant in both districts.

Ogawa (J. M.), Sanborn (R.), English (H.), & Wilson (E. E.). **Late season protective and eradicative sprays as means of controlling brown rot of Peach fruit.**—*Plant Dis. Reptr*, 38, 12, pp. 869–873, 1954. [Multilithed.]

In 1954 peach trees in Californian commercial orchards were given pre- and post-infection treatments for the control of brown rot (*Sclerotinia fructicola*] [*R.A.M.*, 33, p. 96; 34, p. 305]. Captan (2 lb. per 100 gals. spray), flotax wettable sulphur (10 lb.), and maneb (2 lb. plus 1 oz. Du Pont spreader sticker) all gave good protection, reducing the percentage of diseased fruits from 11·6 on Fortuna and 17·6 on Peak to 4·6 or less. The same preparations and ziram (2 lb. plus 2 oz. Du Pont) were effective as protectants on Sims trees sprayed with spores to obtain a high disease incidence.

Of the eradicants tested, lime-sulphur (2 gals. per 100 gals. spray) proved the most effective, reducing the percentage of diseased Peak fruits from 52·6 (untreated) to 16·2. An application 38 hours after the beginning of rain prevented further

development of infection. It is suggested that in the event of rain during harvest, a combination of lime-sulphur and wettable sulphur would effectively arrest incipient infection and protect fruit against further infection under Californian conditions.

Millikan (D. F.) & Anderson (J. R.). **The phony Peach virus in Missouri.**—*Plant Dis. Reptr*, 38, 12, pp. 834–835, 1954. [Multilithed.]

This survey of the data obtained from yearly inspections for phony peach virus on peach trees [*R.A.M.*, 33, p. 488] in Missouri during the period from 1930 to 1953, inclusive, shows that the disease has been eradicated from all the counties except Dunklin, where there were only 11 diseased trees out of 35,026 inspected in 1953. This is the only county still under quarantine.

Duffield (P. C.) & Leyendecker (P. J.). **Rasp leaf virus discovered in New Mexico on sweet Cherry.**—*Plant Dis. Reptr*, 38, 12, pp. 832–833, 2 figs., 1954. [Multilithed.]

Cherry rasp leaf virus was recorded for the first time in New Mexico on eight Lambert sweet cherry trees [*R.A.M.*, 31, p. 105] in a 20-year-old orchard at Mountain Park, where it is believed to have been present for the past four or five years.

Darrow (G. M.), Scott (D. H.), & Coheen (A. C.). **Relative resistance of Strawberry varieties to powdery mildew at Beltsville, Maryland, 1954.**—*Plant Dis. Reptr*, 38, 12, pp. 864–866, 2 figs., 1954. [Multilithed.]

At Beltsville, Maryland, in 1954 the reaction of 41 strawberry varieties to powdery mildew (*Sphaerotheca humuli*) [*R.A.M.*, 31, p. 248] was compared in the screenhouse under conditions ideal for the natural development of the disease. Catskill, Dunlap, Empire, Klondike, Konvoy, New York, Orland, Sioux, Sparkle, Tahoe, and Tennessee Shipper were disease-free, while Aroma, Sierra, Albritton, Lassen, Marshall, Missionary, Parramos, and Pocahontas showed high resistance, slight leaf rolling being the only symptom. Under field conditions slightly less injury was observed.

Vaughan (E. K.) & Boller (C. A.). **Experiments on control of bacterial canker of Blueberry.**—*Plant Dis. Reptr*, 38, 12, pp. 867–868, 1954. [Multilithed.]

Bordeaux sprays (8–8–100), applied in October and November, 1952 and 1953, for the control of blueberry [*Vaccinium*] bacterial canker [*Pseudomonas* sp.] in Oregon [*R.A.M.*, 33, p. 362], reduced the percentage of infected plants in the subsequent season from 96·3 (untreated) to 42·6 and from 58·33 to 12·5, respectively, and the average number of cankers per plant from 6·33 to 0·59 and from 2·17 to 0·33. In another experiment in 1953–4 the corresponding reductions for Bordeaux were 56·25 to 31·25 per cent. infection and 2·06 to 0·56 cankers, copper 'A' (6 lb. per 100 gals.) also giving good control (25 per cent. and 0·49).

Hockey (J. F.). **Diseases of the native Blueberry.**—*Progr. Rep. Dom. Blueberry Substa. N.B., 1949–1953*, pp. 16–18, 1955.

Studies from 1949 to 1953 at the Blueberry Substation, Tower Hill, New Brunswick, established that the following are the more apparent diseases causing losses among native crops of blueberry (*Vaccinium* spp.): witches' broom (*Calyptospora goeppertiana*) [cf. *R.A.M.*, 31, p. 401]; red leaf (*Exobasidium vaccinii*) [27, p. 30], which appears in patches in fields throughout the Maritime Provinces and is most pronounced from May to July; and blossom and twig blight, associated in New Brunswick and Nova Scotia with *Botrytis cinerea* [34, p. 42] and *Monilinia* [*Sclerotinia*] *vaccinii-corymbosi* [32, p. 667]. The last disease is greatly reduced by two or three applications of 10 per cent. ferbam dust, the first coinciding with the

appearance of the first leaves and blossoms and the others at ten-day intervals until flowering is over. Dusts should be applied at 15 lb. per acre before prolonged wet weather. Spray experiments near Kentville, Nova Scotia, in 1952 and dust experiments near Tower Hill in 1953 showed that besides giving the best control of twig and blossom blight ferbam was the fungicide least toxic to blueberries.

Miller (P. W.). **Inactivation of non-persistent viruses in Strawberry plants by hot-air treatment.**—*Plant Dis. Reptr*, 38, 12, pp. 827–831, 1 fig., 1954. [Multilithed.]

In joint experiments by the United States Department of Agriculture and Oregon Agricultural Experiment Station 482 strawberry plants were treated by hot air at temperatures of 34° to 38° C. (±1°) to determine the time and temperatures required for the inactivation of non-persistent viruses (crinkle or yellows complexes or both) [cf. *R.A.M.*, 33, p. 541; 34, p. 232]. Forty-three per cent. of the plants survived the treatment and 81 per cent. of these were shown to be free from non-persistent viruses by aphid transmission to *Fragaria vesca*. Inactivation occurred throughout the temperature range tested. A temperature-time combination that gave a relatively high percentage of virus-free plants (87) and plant survival (65) was 36° to 38° for 194 to 288 hours. Well-established plants withstood higher temperatures for longer periods than newly planted ones. The method was applied successfully to the varieties Marshall, Northwest, Redheart, Tahoe, Narcissa, the Oregon-USDA selections 2172 and 2242, and Utah, Sierra, Cupertino, Brightmore, and York, the last five, however, being relatively heat-sensitive.

Frezzi (M. J.). **Phytophthora cinnamomi y su relación con la muerte de los Paltos en Urundel (Salta), Argentina.** [*Phytophthora cinnamomi* and its relation to the death of Avocados at Urundel (Salta), Argentina.]—*Rev. argent. Agron.*, 19, 4, pp. 214–219, 1 fig., 1952. [Received February, 1955.]

Avocado (*Persea gratissima*) trees 10- to 12-years old or more at Urundel, Calielgua, and San Martín del Tabacal, in the province of Salta, Argentina, are severely attacked under humid conditions by root and collar rot caused by *Phytophthora cinnamomi* [C.M.I. map No. 302; *R.A.M.*, 30, p. 433; 33, p. 281; 34, p. 381, and next abstract].

Preventive measures [33, p. 99] include planting in permeable soil or previously drained heavy soil, planting at least 15 m. apart, keeping the collar well above soil-level, and employing a sprinkler irrigation system. Curative methods comprise regular tree inspection, and scraping and disinfecting the affected parts.

Loest (F. C.) & Stofberg (F. J.). **Avocado diseases.**—*Fmg in S. Afr.*, 29, 344, pp. 517–520, 1 fig., 1954.

Root rot caused by *Phytophthora cinnamomi* is the most important and widespread disease of avocado trees in South Africa [*R.A.M.*, 33, p. 99]: those over ten years old are particularly susceptible. Prevention [see preceding abstract] lies in planting on well-drained soil, irrigated only when necessary, regular and adequate fertilization, disturbing the natural leaf mulch as little as possible and improving it by adding well-decayed organic matter, early fruit thinning in years of abnormally dense setting, shading young trees adequately, and, in extreme cases of decline, dehorning the trees and covering or whitewashing them to prevent sunscald.

Scab (*Sphaceloma perseae*) [13, p. 386] is common on the Natal coast and in other humid areas. Certain West Indian varieties are particularly susceptible. The number of sprays required to give control will depend on the weather conditions prevailing during bloom and fruit set. Under severe conditions 3–3–50 Bordeaux should be applied (*a*) at dormancy, (*b*) late bloom to early fruit set, (*c*) after blooming, two to four weeks later, (*d*) three to four weeks later, and (*e*) one month later.

Sunblotch virus [18, p. 694] may seriously curtail the life of the tree, reduce size and yield, and render the fruit unmarketable. As it is propagated through bud-wood, graft-wood, and seed such material should be taken only from healthy trees.

Malan (E. F.). **Pineapple production in South Africa (with special reference to the eastern Transvaal).**—*Bull. Dep. Agric. S. Afr.* 339, 28 pp., 11 figs., 1 map, 1954.

Pineapples in the eastern Transvaal are subject to internal black spot caused by species of *Penicillium*, *Fusarium* [*R.A.M.*, 19, p. 196], and *Cladosporium*, chiefly in winter-ripened fruit. As regular spraying of young fruit with insecticides has not affected incidence, the disease is probably not insect-borne and appears closely associated with weather conditions. There is no effective control as yet either for this or the yellow spot virus [tomato spotted wilt virus: 30, p. 216]. The cause of another yellow spotting of the fruit which recently appeared in certain parts of South Africa is as yet unknown. Spotted wilt is distinguished from it by the green colour of the segment while the rest of the fruit is already yellow. The soil fungi *Phytophthora cinnamomi* [30, p. 423], *P. palmivora*, *P. parasitica*, and *Pythium* spp. reduce crops under certain climatic conditions. Basal rot caused by *Thielaviopsis* [*Ceratocystis*] *paradoxa* [24, p. 166] often causes severe damage when planting material is conveyed for long distances. Immersion in an organic mercurial fungicide before planting or despatch is recommended [loc. cit.].

Gomes (J.). **Cálculos e tabélas para preparo de fórmulas insecticidas e fungicidas.** [Calculations and tables for the preparation of insecticidal and fungicidal formulae.]—*Bol. fitossanit.*, 5, 1–2, pp. 55–81, 1951. [Received November, 1954.]

Tables and calculations are given for the dilution of insecticides and fungicides according to the content of the active constituent, with formulae useful for this purpose, not only for single products but also for mixtures of insecticides and fungicides. Useful information is further provided, *inter alia*, on the equivalent values of weights and measures in the British, American, and metric systems.

Ishizaki (H.). **The mechanism of fungicidal action. IV. The fungicidal action of phygon and protection from its injury.**—*Bull. Fac. Agric. Mie Univ.*, 6, pp. 37–46, 1953. [Abs. in *Chem. Abstr.*, 49, 9, p. 6523, 1955.]

The effects of vitamin K, zinc sulphate, calcium chloride, and thiosulphate compounds on the toxicity of phygon to cultures of *Gibberella saubinetii* [*G. zeae*] and *Fusarium bulbigenum* on potato decoction agar at 28° C. were investigated at Mie University, Japan. After five days the colony diameters (in mm.) of the two species in the presence of 0·025 per cent. phygon were nil, and with 0·0464 per cent. vitamin K, 17 and 12·4, respectively; with phygon plus vitamin K they were 6·2 and 4·9; and with neither adjuvant 72·1 and 63·2. The growth of *G. zeae* was slightly stimulated by the addition of 0·01 to 1 per cent. zinc sulphate but not by the same amount of calcium chloride. The inhibition of germination of wheat seed treated with 0·5 per cent. phygon for 12 hours was counteracted by immersion for the same period in 0·1 per cent. sodium thiosulphate.

Goksøyr (J.). **Reversal of the fungicidal effect of dithiocarbamyl compounds.**—*Nature, Lond.*, 175, 4462, pp. 820–821, 1955.

A study was made of the inversion of the fungicidal effect of dithiocarbamyl compounds at intermediate concentrations [*R.A.M.*, 22, p. 364] at the Central Institute for Industrial Research, Oslo. Using *Saccharomyces cerevisiae* as the test organism, it was concluded that the action of sodium dimethyldithiocarbamate on micro-organisms in the presence of mixed copper and zinc sulphates was due first to a growth inhibition caused by the formation of the 1 : 1 copper complex, followed

by a reversal of the inhibition due to the transformation to the normal 1:2 copper complex, and, when all the copper is chelated, an inhibition due to the formation of the zinc compound. This explanation also holds good for the inversion phenomenon observed with thiram and tetramethylthiuram monosulphide.

Rose (G. J.). **Crop protection.**—xxi+223 pp., 102 figs. (9 col.), 12 diags., London, Leonard Hill, Ltd., 1955. 30*s*.

This practical guide to the protection of crops from the initial seed stage to the stored product comprises, *inter alia*, up-to-date information on cultural control; the various types of fungicidal formulations available; combined formulations; application machinery, including dusting, spraying, and injection systems; the choice and operation of equipment; and prevention of storage and transit losses. A useful summary of control measures, arranged in alphabetical order of hosts, is appended.

McCallan (S. E. A.), Miller (L. P.), & Weed (R. M.). **Comparative effect of fungicides on oxygen uptake and germination of spores.**—*Contr. Boyce Thompson Inst.*, 18, 1, pp. 39–68, 6 graphs, 1954. [Received 1955.]

The effect of several water-soluble and relatively insoluble fungicides on the oxygen uptake and germination of spores of *Neurospora sitophila*, *Monilinia* [*Sclerotinia*] *fructicola*, *Myrothecium verrucaria* [see below, p. 536], *Cephalosporium acremonium*, *Alternaria oleracea* [*A. brassicae*], *Aspergillus niger*, *Stemphylium sarciniforme*, and *Rhizopus nigricans* [*R. stolonifer*] was studied at the Boyce Thompson Institute for Plant Research, New York [cf. *R.A.M.*, 33, p. 437]. The above are in descending order of oxygen uptake in the presence of 1 per cent. sucrose.

The oxygen uptake by spores pretreated for 15 minutes with various concentrations of wettable fungicides was expressed as dosage-response curves based on the percentage control and the ED_{50} values in μgm. fungicide per mg. spores determined. In general the ED_{50} values were lower for germination than for oxygen uptake. *Sclerotinia fructicola* was generally the most sensitive in both responses and *A. niger* the least. Silver nitrate [loc. cit.], copper sulphate, and mercuric chloride markedly retarded oxygen uptake and reduced germination in all species. Cadmium chloride, cycloheximide, and dichlone were toxic to germination but did not reduce oxygen uptake by *N. sitophila*, *M. verrucaria*, or *Alternaria brassicae*. Nabam was without effect. The oxygen uptake by *N. sitophila* was increased markedly by most fungicides. Wettable fungicides tended to affect uptake less than those dissolved in dilute acetone, but there was little difference in the germination response.

Gray (E. A.). **Microbiology. An introduction.**—xii+175 pp., 18 figs., 7 graphs, London, Crosby Lockwood & Son, Ltd., 1954. 10*s*. 6*d*.

The plan of this book, designed as a simple introduction to microbiology, follows that adopted by the author in teaching the subject to classes of laboratory assistants and others more generally interested. Chapters are included, *inter alia*, on the biology of micro-organisms; their culture and control; the host-parasite relationship of cells; disease and immunity; viruses; bacteria; yeasts, moulds, and fungi; the microbiology of soil and of inland waters and the sea; and applied microbiology.

Index of Agricultural Research. 1953–4.—118 pp., London, Her Majesty's Stationery Office, 1954. 5*s*.

This is the second edition of an index covering all State-aided agricultural

research, including the work of the Research Institutes, Experimental Husbandry Farms and Horticulture Stations, the National Agricultural Advisory Service, and the Scottish Agricultural Colleges. The information is arranged first under classified subjects and again under particular animals and crops.

Stevens (N. E.) & Stevens (R. B.). **Disease in plants. An introduction to agricultural phytopathology.**—xx+219 pp., 43 figs., 6 diags., 4 graphs, 8 maps, Waltham, Mass., The Chronica Botanica Company; London, W. Dawson & Sons, Ltd., 1952. $4.75.

In this manual (Volume I of the Manual of Plant Sciences) an attempt has been made to present the subject-matter of plant pathology in a series of 20 lectures, addressed primarily to university students, and embodying such general knowledge and principles as may be universally applicable. The aspects treated include (1) plants, plant disease, and human welfare (pp. 1–12); (2) the effect of disease on plants (pp. 13–20); (3) viruses (pp. 21–32); (4) bacteria and fungi (pp. 33–40); (6) nutritional factors, climatic effects, chemical injury (pp. 47–59); (7) the host (pp. 60–73); (8) the pathogen (pp. 75–83); (9) weather and soil (pp. 84–95); (10) insects (pp. 96–104), including their relation to bacteria, fungi, and viruses; (11) variation and physiological specialization in plant pathogens (pp. 106–115); (12) introduced hosts and pathogens (pp. 116–125); (13) the economy of disease control (pp. 126–137); (14) chemical treatment (pp. 138–147); (15) seed treatment (pp. 148–155); (16) soil treatment, crop rotation (pp. 156–165); (17) sanitation—eradication—quarantine (pp. 166–177); (18) breeding for disease resistance (pp. 178–187); (19) market pathology (pp. 188–198); and (20) handling plant disease problems (pp. 199–206).

Roger (L.). **Phytopathologie des pays chauds. Tomes II, III.** [Plant pathology in the tropics. Volumes II, III.]—(*Encycl. mycol.*, 18, 19), 1,130 pp., 207 figs., 1953; 895 pp., 7 figs., 1954, Paris, Paul Lechevalier. Fr. 10,000 each volume.

The second volume of this treatise [cf. *R.A.M.*, 31, p. 196] is a continuation of the first section of Part II, comprising descriptions of specific parasitic diseases of tropical plants caused by ascomycetes (chapter VI, pp. 1129–1653), imperfect fungi (chapter VII, pp. 1654–2206), and mycelia sterilia (chapter VIII, pp. 2207–2252).

Volume III concludes the first section of Part II with descriptions of diseases caused by algae, lichens, and parasitic mosses or epiphytes (chapter IX, pp. 2259–2273). Section two of Part II has three chapters (pp. 2275–2413) on bacterial diseases; section three two on parasitic phanerogams (pp. 2415–2446); and section four three on virus diseases (pp. 2447–2621). Part III comprises a review of problems of plant health in the tropics with reference to specific types of crops (pp. 2625–2907), concluding with a discussion of hyperparasitism and its application to biological control.

The whole work concludes with a glossary of botanical terms, alphabetical list of abbreviated authors' names and their full designation, analytical key to the contents of all three volumes, list of errata, general alphabetical index, alphabetical list of plants cited, and a list of diseases arranged alphabetically under their hosts.

Kahn (D.) & Frezzi (M. J.). **Contenido micótico del aire de Córdoba.** [The fungus content of the air of Córdoba.]—*Alergia*, 6, 1, pp. 11–14, 2 figs., 1952. [Received 1955.]

Agar plates exposed in Córdoba, Argentina, between 1947 and 1949 trapped spores of *Cladosporium* and *Hormodendrum* (in 84 per cent. of the exposures), *Alternaria* (70·4), *Penicillium* (52·2), *Rhizopus* (27·2), *Aspergillus* (22·7), *Phoma* (20·4), *Fusarium* (15·9), *Helminthosporium* (13·6), and other genera.

KRSTIĆ (M.). **Note on the inhibitory activity of some microorganisms against Phytophthora cinnamomi.**—*Plant Dis. Reptr*, 38, 12, pp. 879–881, 3 figs., 1954. [Multilithed.]

In preliminary studies at Beltsville, Maryland, the growth of *Phytophthora cinnamomi* on potato dextrose agar was inhibited by *Bacillus subtilis* [cf. *R.A.M.*, 34, p. 239], *Penicillium* sp., and *Pleurotus griseus*. More active filtrates were produced by *B. subtilis* in liquid potato-sucrose medium at 34° than at 25° C. and *Phytophthora cinnamomi* stopped growing after 14 days in 1:2 and 1:1 dilutions of the filtrates produced at 34°. Different light conditions affected only *Penicillium* sp., total inhibition occurring in 1:5 to 1:1 dilutions of filtrates from cultures grown in the dark, in 1:2 and 1:1 from those grown in red light, and in 1:1 from those in white.

GOTTLIEB (D.). **Antibiotics and plant protection.**—*F.A.O. Pl. Prot. Bull.*, 3, 1, pp. 1–3, 1954.

The author briefly reviews the current status of antibiotics in plant protection [*R.A.M.*, 32, p. 141; 34, p. 311], the chief points dealt with comprising antibiotics as sprays, seed treatments, therapeutants, other methods of application, materials available commercially, and future prospects.

KOVACHE (A.), LÉVY (R.), GARNIER (G.), & MAGNOUX (C.). **Protection des matières plastiques et des textiles contre les microorganismes. Efficacité de quelques fongicides.** [Protection of plastic materials and of textiles against microorganisms. Efficacy of some fungicides.]—*Chim. et Industr.*, 71, 6, pp. 1136–1139, 1 graph, 1954.

At the Centre d'Études du Bouchet, Seine-et-Oise, France, 35 chemical compounds were tested for efficiency in the control of *Chaetomium globosum*, *Myrothecium verrucaria* [see above, p. 534], *Stachybotrys atra*, *Memnoniella echinata*, *Sterigmatocystis nigra* [*Aspergillus niger*], *A. flavus*, *Trichoderma viride*, *Penicillium luteum*, *Paecilomyces varioti*, and *A. amstelodami* on (*a*) castor oil (a nutrient plasticizer) [cf. *R.A.M.*, 30, p. 182; 32, p. 41; 34, p. 387], and (*b*) cotton fabric both as sole carbon sources in a mineral salts solution.

In the medium containing castor oil members of the Aspergillaceae developed in profusion, inactivating for instance copper naphthenate and the rhodanines [34, p. 167], which confer effective protection against mildew on textiles. Only the organo-mercurials and copper 8-quinolinolate were of any use at low concentrations for mould control in this medium.

The cotton samples were impregnated with 2 per cent. by weight of the chemical before inoculation with the mould spores, some of the tests being preceded by 48-hour leaching in a Soxhlet apparatus and others by accelerated insolation under arc lights for 150 hours. They were then buried in soil for periods of 14 or 28 days at 30° C. and 95 per cent. relative humidity. Though all the products gave adequate protection under ordinary storage conditions, phenyl mercury acetate and three phenyl mercury dithiocarbamates, namely, the dimethyl, methylphenyl, and morpholyl, being particularly active, only copper pentachlorophenoxyacetate was effective in four weeks' soil burial. Insolation inactivated the fungicides, except copper 8-quinolinolate and all the rhodanines but the *p*-chloro. Serious deterioration of cellulose fibres resulted from some of the decomposition products.

Mixtures of copper 8-quinolinolate with phenyl mercury acetate or with copper pentachlorophenoxyacetate plus copper diphenyltriazene appreciably increased the protection of the textile without augmentation of the concentration.

SMALL (J.). **Modern aspects of pH with special reference to plants and soils.**—xi+247 pp., 6 diags., 24 graphs, London, Baillière, Tindall & Cox, Ltd., 1954. 20*s*.

This treatise is concerned throughout with the new view of the limits of accuracy

obtainable in pH estimations as applied to agriculture, soils, buffered solutions, plant extracts, foods, and many industries. In 1950 a controversy which began in 1912 reached an end with the official recognition that what was being measured in pH estimations was not the hydrogen-ion concentration but the hydrogen-ion activity in relation to the activity of other associated ions.

The new outlook is first discussed in general terms; subsequent chapters deal with buffer systems and index values, pH and cell sap, carbon dioxide effects, base avidities of surfaces and non-aqueous media, environmental pH relations, buffer capacity of soil, soil pH values in ecology, water pH values in ecology and soil pH in agriculture, plant hormones and pH, enzymes and pH, pH and succulents, and pH in industry.

In appendix I pH data for some micro-organisms, including a number of important plant pathogens, are presented under the captions of pH of the medium and pathology, pH and spore germination, and pH and growth of disease organisms. Appendix II treats of dissociation curves from the practical, as distinct from the mathematical, standpoint. There is a 15-page selected bibliography.

KALYANASUNDARAM (R.) & SARASWATHI-DEVI (L.). **Zinc in the metabolism of Fusarium vasinfectum Atk.**—*Nature, Lond.*, 175, 4465, p. 945, 1 graph, 1955.

Studies at the University Botany Laboratory, Madras, demonstrated the indispensability of zinc for normal growth of *Fusarium vasinfectum* [*R.A.M.*, 34, pp. 319, 397] and antibiotic production, the latter taking place only at zinc levels above 2 μgm. and being inhibited completely at 100 μgm., while the peak of activity occurred at a much higher zinc level than that at which the organism grew normally.

MCKAY (R.). **Potato diseases.**—x+126 pp., 107 figs. (4 col.), Dublin. At the Sign of the Three Candles, 1955. 21*s*.

This publication of the Irish Potato Marketing Company, Ltd., intended for growers, seedsmen, and exporters, may be regarded as a revised account of 'Section IV, Potato diseases' of the late W. D. Davidson's 'Potato Growing for Seed Purposes' [*R.A.M.*, 17, p. 409]. Essential information is clearly set forth on a number of well-known bacterial, fungus, virus, and non-parasitic diseases, with special emphasis on their macroscopic symptoms.

Part VI of the Destructive Insect and Pest Act Regulation, governing the production and sale of Canadian certified seed Potatoes. Canadian Department of Agriculture.—8 pp., 1953.

These regulations [cf. *R.A.M.*, 28, p. 480] became effective from 24th September, 1953. 'Certified' seed potatoes are allowed a maximum tolerance of 3 per cent. diseased specimens, including 2 per cent. all virus diseases [34, p. 430], at the first inspection and 2 per cent. and 1 per cent., respectively, at the second. The corresponding percentages for 'foundation' seed are 0·5 and 0·25, 0·25 and 0·1. All crops which have come into contact with bacterial ring rot [*Corynebacterium sepedonicum*: 34, p. 433] and which could have become contaminated with the disease, will be rejected as seed.

MÜNSTER (J.). **Lutte préventive contre les viroses de la Pomme de terre.** [Preventive measures against Potato viroses.]—*Rev. rom. Agric.*, 9, 3, pp. 21–22, 1 diag.; 6, pp. 45–47, 1 graph, 1953.

In those parts of Switzerland where aphids appear in June, the incidence of serious virus diseases in seed potatoes grown for certification [*R.A.M.*, 34, p. 241] from plants multiplied only once is regularly lower than in those increased more than once. In tests in 1952 incidence of serious virus diseases in plants of four varieties multiplied once only was 2·5 and 9·5 per cent. for categories A and B

[32, p. 444], respectively, the corresponding figures for plants multiplied more than once being 7·4 and 13·4 per cent.

The evidence showed that prevalence of virus diseases is due to late roguing. In spring, plots planted with tubers multiplied several times generally contain a few diseased plants, which growers neglect to remove promptly, deferring the operation until the day before the inspection. If insects are present in June, healthy plants can be infected from these diseased ones, and the inspection is rendered worthless, as the disease is not yet visible on the newly affected plants. The remedy lies in pre-germination and early planting, which allows early diagnosis of affected plants. This practice also favours rapid tuber formation, very desirable for the A certificate, for which the destruction of the haulms before maturity is necessary.

In the second article field experiments at Beau-Cèdre are reported. In 1951 haulms of Bintje and Erdgold potato plants were destroyed on 11th July by various methods [34, p. 210]. In the 1952 season the percentages of combined mosaic and leaf roll viruses in the Bintje variety were: mutilation and treatment with 3 per cent. tufan or M 116 (DNC) at 1,600 l. per ha., 5·6; mowing and tufan, 5·9; mutilation and 5 per cent. P 52 (non-commercial, phenol and homologues) at 2,000 l., 6·3; mowing and P 52, 7·4; mutilation and 1 per cent. P 51 (non-commercial DNC), at 2,000 l., 11·4; mowing and P 51, 7; mutilation and 2 per cent. AA morta (sodium arsenite) at 1,000 l., 10·3; mowing and AA morta, 3·9; manual pulling 1; untreated 8·3. The corresponding figures for Erdgold were 20, 21·3, 29, 19·7, 29·6, 22·3, 23·3, 22·7, 1, and 16·6.

These results are considered to confirm the view that of all methods of destroying potato haulms hand pulling is the most effective with all varieties for the control of virus diseases.

Kristensen (H. R.). **Indvendige rustpletter i Kartoffelknolde.** [Internal rust spots in Potato tubers.]—Reprinted from *Landbonyt, 1954*, October, 3 pp., 3 figs., 1954.

The tubers of several potato varieties in Denmark, especially Alpha, are affected by internal rust spots resembling those associated with potato yellow dwarf virus in the United States and Canada [*R.A.M.*, 33, p. 466]. The trouble is most prevalent on dry, light soils, especially heathland, some of which harbour the virus causing stem mottle in Holland [32, p. 145; cf. also 33, p. 588]. No definite connexion has been traced, however, between the presence of the virus and the occurrence of internal rust spots. A late-season symptom of the disorder is a rolling of the reddish- to yellowish-tinted apical leaves. The small, malformed tubers are tightly clustered round the stem.

Panjan (M.), Lušin (V[era]), & Prpić (Z.). **Brzina izrodjivanja Krumpira kod čupane i nečupane cime.** [The rate of Potato degeneration with the foliage removed and not removed.]—*Zasht. Bilja* [*Plant Prot., Beograd*], *1954*, 24, pp. 41–48, 1954. [English summary.]

Laboratory tests and field trials at the Institute for Plant Protection, Zagreb, Yugoslavia, were conducted from 1951 to 1953, inclusive, on eight potato varieties from England and Holland. There was little difference in [? virus] degeneration, as determined by the number of tubers developing hair sprouts in the following season, between those allowed to keep their leaves and those from which they were removed ten days after flowering. Removing the foliage without roguing was of little value. Foliage removal caused no significant differences in infection by potato leaf roll virus [cf. *R.A.M.*, 33, p. 624] and potato viruses X [31, p. 349], A, and Y [30, p. 535], as determined by field symptoms and laboratory tests. Potato plants growing in the vicinity of Zagreb degenerated rapidly irrespective of whether foliage had been removed or not. Of the eight varieties tested Voran and Böhm

degenerated more slowly than the other varieties. Hair-sprout was more severe following high temperatures at the time of tuber maturation.

THIRUMALACHAR (M. J.). **Inactivation of Potato leaf roll by high temperature storage of seed tubers in Indian plains.**—*Phytopath. Z.*, 22, 4, pp. 429–436, 1954.

Tubers of Phulwa and Darjeeling Red Round potatoes affected by leaf roll and stored during the summer in the Patna plains at room temperature produced healthy plants in the following season; plants from similarly affected tubers stored in refrigerated cold stores developed 100 per cent. leaf roll. Of tubers from 36 single plants half were stored at room temperature and half in a cold store. All sprouts from cold storage tubers were infected, while after warm storage all were healthy. Variations of these experiments invariably gave similar results [cf. *R.A.M.*, 29, p. 168]. In tubers stored for over six months in Bihar at average maximum temperatures ranging from 29·4° to 35·6° C. indoors, a cumulative reduction in leaf roll occurred, declining from 100 per cent. at the outset to 91, 46, 13, 8, 4, and 0 per cent. at monthly intervals. Only tubers stored until the end of September (i.e. for six months) gave rise to plants completely free from leaf roll.

BULLEN (E. R.) & DADD (C. V.). **Saving money on seed Potatoes.** –*J. Minist. Agric.*, 61, 3, pp. 111–114, 1954.

Suggestions for economizing on the cost of seed potatoes in eastern England include reduction of the seed rate by using smaller tubers or wider spacing, cutting the tubers, and the more extensive use of once-grown Scottish or Irish seed.

In 14 experiments carried out in East Anglia between 1949 and 1951 the most important factor determining the yield obtained from once-grown Majestic seed was leaf roll virus infection [*R.A.M.*, 32, p. 691]. On an average, once-grown stocks from five different soil types gave 93 per cent. of the total yield and 89 per cent. of the ware yield of seed direct from Scotland. Excluding stocks grown on Cambridgeshire black fen, where high virus infection could not be prevented, the reduction was only 6 cwt. per acre in total yield or 10 cwt. in ware.

Crops intended for seed production should be isolated from other potato crops and grown in fields free from groundkeepers. The best seed is produced in crops not fully matured, the haulm being removed chemically or mechanically when the tubers reach seed size.

CULLEN (J. C.). **Maincrop Potato variety trials, 1942–1952.**—*J. nat. Inst. agric. Bot.*, 6, 3, pp. 361–395, 1 graph, 1953.

During a ten-year period from 1942 to 1952 a series of yield trials of maincrop potato varieties were carried out at Cannington, Wistow, Kirton, Cambridge, and Sutton Bonington. Blight [*Phytophthora infestans*: *R.A.M.*, 34, p. 172] was observed at most of the above-mentioned centres in the period 1946–49, at some becoming epidemic by the end of August. In 1946, Ulster Cromlech was first and most severely attacked, while Arran Viking was least damaged at two of the centres. In 1947, blight was again most severe on Ulster Cromlech, although at two centres the severity of attack was similar to that on Majestic, and Stormont Dawn. Ulster Earl was the least susceptible, followed by Arran Viking. A similar varietal reaction was recorded in 1948 and 1949.

A three-year comparison between centres where blight was severe and where it did not occur indicated that the disease may reduce the average yield of Ulster Cromlech by 10 per cent. or more, the differences at individual centres being 40 per cent. or more.

Common scab [*Actinomyces scabies*: 33, p. 244] where it occurred, jelly end rot [cf. 33, p. 176] at one centre, and black scurf [*Corticium solani*: 23, p. 76], under cold and wet planting conditions in northern centres, were more severe on Dr.

McIntosh, but there was little difference between the maincrop varieties in their reactions.

Bourke (P. M. A.). **Potato blight and the weather : a fresh approach. The Potato blight weather warning service in Ireland in 1952. Potato blight and the weather in Ireland in 1953.**—*Tech. Notes met. Serv. Eire* 12, 11 pp.; 13, 45 pp., 1 graph, 32 maps; 15, 23–14 [unnumbered] pp., 10 diags., 46 maps, 1953. [Mimeographed. Received September, 1954.]

The first bulletin, intended primarily for the use of meteorologists, embodies fresh criteria for the recognition of weather favourable to outbreaks of potato blight (*Phytophthora infestans*) in the Republic of Ireland [*R.A.M.*, 34, p. 393]. The Irish rules, based on hourly meteorological reports, require (*a*) at least 12 consecutive reports in which the temperature is equal to or greater than 50° F. and the relative humidity at least 90 per cent., and (*b*) free moisture on the leaves for a subsequent period of at least four hours, or, alternatively, a further four hours with relative humidity at least 90 per cent. These rules are slightly modified from those in operation in England [33, p. 244] and Holland [30, p. 537].

During the first season of broadcast warnings in Ireland [? 1952], warnings were issued only when a significant humid period had already been observed and at the same time the expected favourability or otherwise of the following weather was indicated. When applicable, forecasts of suitable spraying weather were also made.

In the second paper an analysis is made of the course of potato blight during 1952 in relation to the broadcast warnings. Observing stations participating in the service were at Valentia Observatory, Midleton, Claremorris, and Dublin Airport. The first field attacks were observed on 20th May on Epicure in Waterford but there was little further spread. Widespread attacks occurred in July, the situation improving later. The occurrence of blight weather proved to be in good agreement with the subsequent course of the disease in particular districts and over the country as a whole.

In the third contribution the progress of blight in 1953 and the corresponding occurrences of blight weather and broadcast warnings are outlined and the measure of success achieved during the season is discussed. As in the preceding year there was no serious attack early in the season. June was almost devoid of blight weather but a spell of maritime tropical air from 4th to 9th August resulted in a destructive attack, and by the end of the month many crops, especially in coastal areas, were defoliated. The duration of this damaging spell of weather was underestimated but on the whole the Irish rules were adequate for the warning system.

The author speculates on the uncertainty of forecasting blight outbreaks and attributes this to lack of knowledge about the disease.

Keller (E. R.). **Augusta und Benedikta, zwei neue Kartoffelsorten im Schweizerischen Richtsortiment.** [Augusta and Benedikta, two new Potato varieties in the Swiss official list.]—*Mitt. schweiz. Landw.*, 3, 3, pp. 42–44, 2 figs., 1955.

The new, medium-early potato variety Augusta, a selection from the cross Bona × Sämling, is resistant to wart [*Synchytrium endobioticum*], fairly resistant to blight [*Phytophthora infestans*: *R.A.M.*, 34, p. 315], markedly resistant to or tolerant of virus diseases [34, p. 212], but somewhat susceptible to scab [*Actinomyces scabies*].

The medium-late Benedikta, from Aquila × Sämling, is fairly resistant to blight, but susceptible to virus diseases. Both varieties are more suitable as fodder than for the table.

Harrison (D. E.) & Downie (W. A.). **Rhizoctonia of Potatoes—control by dipping.**—*J. Dep. Agric. Vict.*, 53, 4, pp. 165–167, 2 figs., 1955.

Experiments at the Potato Research Station, Healesville, Victoria, during the

past four years have demonstrated that the tuber-borne phase of *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, 33, p. 556; 34, p. 315] may be controlled by pre-soaking the dormant tubers in water for 24 hours before dipping for ten minutes in inorganic acid mercury compounds and drying rapidly away from sunlight. The rates used for 25 gals. of solution are approximately 4 oz. mercuric chloride and 2 pints hydrochloric acid per ton of tubers (costing approximately 16s.).

M[ÜNSTER] (J.). **Dégâts causés par l'Alternariose sur les tubercules de Pommes de terre.** [Damage caused by alternariosis to Potato tubers.]—*Rev. rom. Agric.*, 9, 10, p. 84, 1 fig., 1953.

During storage in the autumn of 1953 in Switzerland, culinary potato tubers, especially those of the Bintje variety, were observed to bear lesions caused by *Alternaria* [*solani*: *R.A.M.*, 34, p. 211]. Infection had been facilitated by injuries during harvesting. All affected tubers should be discarded and the remainder stored in well aerated conditions for at least three weeks, after which, if only a few infected tubers are present, they can then be marketed in the usual way.

THIRUMALACHAR (M. J.). **Incidence of charcoal rot of Potato in Bihar (India) in relation to cultural conditions.**—*Phytopathology*, 45, 2, pp. 91–93, 1955.

Losses from charcoal rot (*Botryodiplodia* [*Macrophomina*] *phaseoli*) in potato in Bihar, India [*R.A.M.*, 33, p. 451] are stated to range from 10 to 70 per cent., depending on varietal reaction [34, p. 480] and predisposing conditions. The fungus gains ingress to the tuber from the soil mainly through proliferated lenticels. There is no secondary spread of infection from diseased to healthy tubers during storage. The local growing season extends from October to March, and in experiments to determine the practicability of control through cultural operations early planting (by mid-October) and harvesting after 110 and 140 days for the Darjeeling Red Round and Phulwa varieties, respectively, reduced the incidence of infection and produced adequate yields. Thus, in Darjeeling Red Round planted on 17th October, 1950, and harvested on 1st March, 1951, only 20 per cent. of the tubers were diseased as compared with 53 per cent. for the planting of 29th November lifted on 15th April, the corresponding figures for Phulwa being 16 and 30 per cent., respectively. Protracted storage of tubers in the soil after the temperature has risen to 32° C. or more conduces to the development of charcoal rot.

In the case of the late-planted crop harvesting after 90 days prevents heavy infection. For instance, the percentage of rot in Darjeeling Red Round tubers planted on 20th November and lifted on 16th February was only 11 as against 78 for the harvest of 15th April. Raising the number of weekly irrigations after mid-February from one to two was also beneficial [cf. 24, p. 202] to the same variety, lowering the percentage of decayed tubers in the crop of 16th April from 57 to 37.

URITANI (I.) & MIYANO (M.). **Derivatives of caffeic acid in Sweet Potato attacked by black rot.**—*Nature, Lond.*, 175, 4462, p. 812, 1955.

In a further contribution to the biochemistry of sweet potato attacked by *Ceratostomella* [*Ceratocystis*] *fimbriata* from Nagoya University, Japan [*R.A.M.*, 34, p. 248], three polyphenol fractions were isolated from the healthy tissue of diseased sweet potatoes. Two of the fractions, which were also present in rotted tissues, were identified as pseudochlorogenic acid and *iso*-chlorogenic acid, while the third was quite dissimilar and seemed to be a polymer. All three fractions were decomposed by alkali into caffeic and quinic acids.

DION (H. G.). **Reports of the second and third meetings of the working party on fertilizers. Bandung, Indonesia, May, 1952; Bangkok, Thailand, September, 1953.**—iv+45 pp.; vi+46 pp., F.A.O., Rome, 1953. [Received 1954.]

In the section of the 1952 report dealing with the micronutrient requirements of

rice (p. 22) it is noted that in Malaya no response was obtained by adding micronutrients to an infertile paddy soil. A similar test in India indicated a definite improvement following the addition of manganese and zinc sulphates. In Japan autumn decline or 'akiochi' [see following abstracts] on degraded soils subject to leaching of manganese [*R.A.M.*, 32, p. 449] from the surface layers is partially corrected by additions of manganese, which also decrease the incidence of *Helminthosporium* [*Ophiobolus miyabeanus*: 34, p. 104].

In the micronutrient section (pp. 24–25) of the third report it is stated that 'akiochi' disease in Japan is controlled by a soil application of 200 kgm. manganese sulphate per ha. plus iron, or sprayed at one tenth the concentration within 20 days of transplanting. Further information on this disease is given in the section dealing with physiological diseases of rice (pp. 28–30). In the first stages plants affected by 'akiochi' grow very vigorously but towards harvest are severely attacked by sesame-spot disease [*Ophiobolus miyabeanus*] and blast [*Piricularia oryzae*: 34, p. 105]. As a result the leaves die one by one, the lower ones first, and the yield of grain is very small. It is estimated that 20 per cent. of the Japanese rice producing area is affected by the akiochi phenomenon; the damage is attributed to the reducing action of a degraded paddy soil causing injury to rice roots by the production of soluble sulphides and hydrogen sulphide [32, p. 695]. The application of young clay, and active iron and manganese is very beneficial to these soils.

Other physiological diseases discussed include rice mentek, which workers in Java still believe to be due to potassium deficiency [33, p. 558].

Baba (I.). **Varietal differences of the Rice plant in relation to the resisting capacity to root-rot disease, induced by hydrogen sulphide, and a convenient method to test them.**—*Proc. Crop Sci. Soc. Japan*, 23, 3, pp. 167–168, 4 graphs, 1955. [Japanese, with English summary.]

At the National Institute of Agricultural Sciences, Japan, rice varieties tolerant of 'akiochi' disease [manganese deficiency: see preceding abstract] showed a higher resistance to root rotting induced by hydrogen sulphide [*R.A.M.*, 34, p. 60] than less tolerant varieties. The resistance of rice to root rot may be estimated in the laboratory by the degree of blackening induced when the roots are immersed in a dilute solution of hydrogen sulphide, susceptible varieties showing the most blackening.

Arashi (K.) & Eguchi (H.). **Studies on the growth of culm in Paddy and variation of starch content in internodes between normal and 'akiochi' plants.**—*Proc. Crop Sci. Soc. Japan*, 23, 3, pp. 169–173, 5 graphs, 1955. [Japanese, with English summary.]

The starch content of rice plants affected by 'akiochi' decline [due to manganese deficiency: see preceding abstracts] is lower than in healthy plants, but this difference decreased acropetally. If this is due to the earlier translocation of carbohydrates to the panicle, followed by a retardation of translocation, it would account for the failure of the grain to develop properly in 'akiochi'-affected plants.

Watts Padwick (G.). **Seed dressings in the control of diseases of Rice.**—*Plant Prot. Overseas Rev.*, 4, 3, pp. 79–89, 2 pl., 3 diags., 1954.

The author reviews, with reference to the literature (25 titles), the symptoms, etiology, world distribution, and economic importance of the principal diseases of rice, and also the response of varieties to infection. The use of seed dressings to control foot rot or bakanae disease (*Gibberella fujikuroi*) [*R.A.M.*, 34, p. 81] and brown spot (*Helminthosporium oryzae*) [*Ophiobolus miyabeanus*: loc. cit.; 34, p. 251] is described.

VAN EMDEN (J. H.). **Report of the Mycology Department for the year 1953.**—*Rep. Rubb. Res. Bd Ceylon, 1953*, pp. 57–68, 1954. [Received 1955.]

In this report [cf. *R.A.M.*, 33, p. 254] it is stated that during 1953 incidence of rubber powdery mildew (*Oidium heveae*) in Ceylon [see following abstracts] was very light. It is suggested that the problems of disease control should be kept in mind when new clearings are made [34, p. 60], and the fields planned accordingly. Treatment of *Fomes lignosus* [34, p. 61] has become a routine practice. Serious secondary leaf-fall, presumably due to *Gloeosporium* sp. [cf. 34, p. 397], occurred on one estate, and a few cases of *Phytophthora* leaf fall [28, p. 195; 29, p. 170; 34, p. 177] were reported. In the nurseries bird's eye spot (*Helminthosporium* [*heveae*: 33, p. 255]) was very prevalent, but not serious enough to affect growth.

A new model of the 'micron sprayer' [34, p. 61], the 'plantation sprayer', may solve the problem of spray application in existing rubber plantations. The weight has been reduced to under 200 lb., and the capacity of the tank to 5 gals.

VAN EMDEN (J. H.). **Notes on the incidence and control of Oidium heveae in Ceylon.**—*Quart. Circ. Rubb. Res. Inst. Ceylon*, 30, 1, pp. 20–28, 1954. [Received 1955.]

In Ceylon powdery mildew (*Oidium heveae*) [*R.A.M.*, 34, p. 61 and preceding abstract] can occur with disastrous effects in all the rubber-growing areas [28, p. 194]; in the higher regions it is present throughout the year, is more difficult to control, and because of its continuous attacks on the young leaves the long-term effect on the trees is much more serious than it is at lower elevations, where infection is usually inconspicuous except during refoliation after wintering. Many clones reasonably resistant in the low country, e.g., PB. 86, do not show this characteristic in the high. Even LCB. 870 [30, p. 541; 34, p. 61], highly resistant at the altitudes at which rubber is usually grown, may be seriously diseased at altitudes over 2,000 ft. TJ 1 [33, p. 255] was badly affected in 1954, and appears to be even more liable to infection than BD. 5 [27, p. 541; 33, p. 254]. PB. 86, PR. 107, and HC. 28 escaped lightly, and favourable reports of MK 3/2 were received. LCB. 870 remained unaffected at Kepitigalla Estate (1,580 ft.) even without sulphur treatment.

Manuring cannot replace sulphur dusting as a means of controlling *Oidium*. The practice of applying large quantities of nitrogen immediately before the trees start to 'winter' must be regarded as dangerous, experience with other crops indicating that it increases sensitivity to powdery mildew. If a grower cannot afford both to manure and dust all his rubber, he should not concentrate on one of these methods only, but should apply both to as many of his most valuable fields as he can.

The high cost of crown-budding [31, p. 630] could be reduced by (*a*) adopting a system of hedge or avenue planting [34, p. 61] or (*b*) reducing the height of the budding from 8 to 6 ft. Until more is known, however, about the influence of the crown on the productivity of the centre portion, growers are not recommended to crown-bud at less than 8 ft. The spacing of trees by the hedge-planting system renders conditions less favourable to *O. heveae* by permitting better circulation of air.

The evidence obtained in 1954 confirmed the view that five rounds of 12 lb. of sulphur per acre [31, p. 631] at intervals of one week give satisfactory control on average clones and under average conditions. When attacks are severe, however, the protection provided is insufficient. In an experiment in which falling leaves were caught on sample areas of 9 sq. ft., dusting at this rate reduced leaf fall to half that from untreated trees, and to 30 per cent. when two applications per week were given. It is recommended that sulphur powders with machine-mixed stickers should be tried.

In 1953 weekly spraying with wettable sulphur at 4 lb. per acre or with lime-sulphur at 1½ gals. per acre gave virtually complete protection to the trees actually

sprayed, but application difficulties were considerable. Until a different type of sprayer, cheaper to operate, becomes available, there is no purpose in considering spraying for the average rubber estate in Ceylon. Spraying may, however, be considered for estates where, owing to the elevation, dusting is ineffective, or for estates planted in hedges or avenues, where spraying would be less expensive than on estates with normal square or rectangular planting.

It is recommended that for the next refoliation season commercial estates should provide for one sulphur dusting round (12 lb. per acre), increasing to two rounds per week for heavier attacks; one machine is needed for one round on 300 to 350 acres and two for two rounds. A safe estimate is to allow enough dust for two applications a week over half the area and one machine for each 250 acres.

YOUNG (H. E.). **Ustulina rot of Rubber trees.**—*Adv. Circ. Rubb. Res. Inst. Ceylon* 47, 2 pp., 1954.

A brief, popular account is given of *Ustulina* rot of rubber (*U. deusta*) [cf. *R.A.M.*, 31, p. 513, *et passim*] under the following headings: distribution and species attacked, damage caused by the parasite, recognition of the disease, fruiting bodies of the fungus, spread, and control. Material likely to act as a source of infection, infected parts of trees, or badly infected whole trees should be removed; scars should be disinfected and tarred and large cavities filled with cement, the cortical zone being left free to form a callus over the filling [9, p. 672]. If several infected trees occur in a group, a trench should be made round the area and the soil replaced after all the trees have been treated. Trenching is unnecessary if affected trees are carefully extirpated.

YOUNG (H. E.). **Oidium leaf disease.**—*Quart. Circ. Rubb. Res. Inst. Ceylon*, 30, 2, pp. 51–60, 1954. [Received 1955.]

In Ceylon *Oidium heveae* is present throughout the year on the common weed *Euphorbia pilulifera* [*R.A.M.*, 30, p. 541]. Climatic conditions do not affect the development of the fungus on this weed as much as they do on rubber. Its leaves bear numerous long fine hairs which prevent wetting of the leaf surface, and the spores of *O. heveae* are able to infect the leaf surface despite continuous wet weather. The weed is very common in the drier parts of Ceylon. This article summarizes current knowledge on rubber mildew in Ceylon.

YOUNG (H. E.). **Diplodia dieback and collar rot of Hevea and blue spot of crepe Rubber.**—*Adv. Circ. Rubb. Res. Inst. Ceylon* 44, 4 pp., 1954.

A brief account is given in popular terms of the symptoms and control of die-back and collar rot of *Hevea* rubber trees in Ceylon, caused by *Botryodiplodia theobromae* [*R.A.M.*, 33, p. 254; 34, p. 396], and of blue spotting of crêpe rubber caused by the same fungus. The most important predisposing factor in die-back locally is attack by *Oidium heveae* [see preceding abstract]. In Ceylon die-back can largely be prevented by correct agricultural practices, including effective control of *O. heveae*, rational manuring and tapping methods, and proper tree sanitation.

The collar rot form of the disease occurs mainly on plants under two years of age, particularly budded plants [cf. 12, p. 784; 21, p. 97; 34, p. 396]. Invasion is favoured by sun scald and lack of moisture. The snag left after budding readily becomes infected, and the fungus spreads easily into the living tissues.

YOUNG (H. E.). **Pink disease.** –*Quart. Circ. Rubb. Res. Inst. Ceylon*, 30, 2, pp. 47–50, 1 fig., 1954.

In this account of pink disease of rubber, caused by *Corticium salmonicolor* [cf. *R.A.M.*, 33, pp. 256, 318], it is stated that preventive measures consist in facilitating air circulation and keeping the ground free from fallen branches, on

which the fungus may develop saprophytically. Curative methods include spraying, painting, and the usual surgical methods [31, p. 295 *et passim*].

Langford (M. H.). **Hevea diseases of the Amazon valley.**—*Bol. téc. Inst. agron. Norte* 27, 29 pp., 13 pl., 1953. [Received November 1954. Spanish, French, and German summaries.]

In this bulletin the major *Hevea* rubber diseases of the Amazon valley [*R.A.M.*, 34, p. 176] and the recommended control measures are described. Most of the information has already been noticed in this *Review*. The diseases treated are South American leaf blight (*Dothidella ulei*) [loc. cit.], *Phytophthora palmivora* [loc. cit.], target leaf spot (*Pellicularia filamentosa*) [*Corticium solani*: loc. cit.], *Glomerella cingulata* [34, p. 177], black crust (*Catacauma huberi*) [34, p. 176], causing minor damage only which can be reduced by avoiding over-susceptible clones, pink disease (*Corticium salmonicolor*) [loc. cit.], present only in some plantations and on less than one per cent. of the trees, and collar rot, caused by various fungi, which does great damage to young seedlings. Collar rot infection takes place through sunburn injuries above the soil line and may be controlled by covering the soil at the base of the plants thinly with straw or dead grass, or, if possible, by planting in advance of hot dry weather. At Belem and Belterra heavy leaf fall due to target spot was confined to the three wettest months. Control is effected by spraying with dithane Z-78 or parzate in nurseries, and by the use of tolerant top-budding clones in field plantings.

Root disease.—*Plant. Bull. Rubb. Res. Inst. Malaya*, N.S., 10, pp. 14–19, 1954.

This article deals with the three major root parasites of *Hevea* rubber in Malaya, namely, *Ganoderma pseudoferreum*, *Fomes lignosus*, and *F. noxius* [*R.A.M.*, 33, p. 256]. Characteristic symptoms easily recognized in the field, spread and control of the disease, are described briefly, most of which has already been noticed in this *Review*. Frequent examinations reveal the rhizomorphs before penetration of the fungus has extended to the collar. They should be scraped off by severing the whole of the penetrated part, and the root surface treated with a fungicide. The diseased lateral must then be traced to its original source, e.g. a stump or root fragment, which is removed and burnt to prevent further infection.

Mouldy rot.—*Plant. Bull. Rubb. Res. Inst. Malaya*, N.S., 6, pp. 57–60, 1 fig., 1953.

In this paper it is stated that mouldy rot (*Ceratostomella* [*Ceratocystis*] *fimbriata*) of the tapping panel on rubber trees [*R.A.M.*, 33, p. 256] in Malaya can be controlled by more frequent applications of better fungicides, a list of those available locally being given together with the recommended concentrations. All trees should be sprayed after every tapping when treatment is given during this process, up to 12 applications on alternate days being given only to the most recently tapped two or three inches of bark. A fine spray with a rate of delivery less than $\frac{1}{2}$ pint per minute in a narrow cone of 6 in. diameter, one foot from the nozzle, and a spray tank containing $1\frac{1}{2}$ to 2 gals. are most suitable. Control is easier if trees are taken out of tapping, when spraying need be only at four-day intervals. On reopening the cut, however, sprays should be applied after the first two or three tappings. A scheme is suggested for systematic eradication in cases where the disease has been extremely severe or difficult to eradicate, in which spraying should be continued every third or fourth tapping day until wet weather ceases. Sterilization of the tools is recommended as an additional precaution. Colouring the fungicidal solution with methylene blue (1 oz. per 10 gals.) is of assistance to supervisors. Attention is drawn to the danger of excessively deep tapping, which favours the incidence of the disease.

Warcup (J. H.). **Isolation of fungi from hyphae present in soil.**—*Nature, Lond.*, 175, 4465, pp. 953–954, 1955.

The following technique for isolating fungi directly from hyphae present in soil [cf. *R.A.M.*, 29, p. 530] was devised at the Waite Agricultural Research Institute, Adelaide, South Australia. A soil crumb is saturated with water and broken apart by means of a rapid jet of tap water. The heavier particles are allowed to sediment and the suspension is removed repeatedly until the liquid remains clear after standing from 1 to 1·5 minutes, when the soil particles of the residue are plated in a small quantity of water. Individual hyphae or portions thereof are removed to a drop of sterile water. As many as possible of the attached humus particles are removed and hyphal masses must be teased out. When there are 20 to 50 hyphae on the plate it is poured with melted but cooled agar (Dox plus yeast agar at pH 5·6 to 5·8 diluted to one-sixth the normal strength) and the hyphae are dispersed by shaking and rotating the plate before the agar solidifies. Most hyphae begin to grow by the second or third day but some show no definite growth until seven to nine days have passed. All clean hyphae showing growth or hyphal tips are cut out in an agar block and transferred to a fresh medium. Some hyphae grew no more than 50 to 100 μ on the above medium or any other tested. However, the method has enabled the isolation of *Rhizoctonia* [*Corticium*] *solani* without the aid of a host, both from soils where it was known to cause disease and from others where its presence was not suspected. Together with the dilution plate technique [33, p. 501] it is in current use to study the ecology of the soil fungi occurring in a wheat field at the Institute. In this about 80 species of fungi have been isolated by the direct hyphal method and most of them, even when shown to be abundant in soil as mycelium, were absent from dilution plates prepared from the same soil samples. The fungi isolated from hyphae fall into two broad groups: those which are also frequent on dilution plates and a large group of non-sporing fungi including basidiomycetes which are absent from them.

Leaf (Genevieve L.). **Boron in relation to water balance in plants.**—*Proc. Iowa Acad. Sci.*, 60, pp. 176–191, 3 figs., 5 graphs, 1953. [Received June, 1955.]

The effect of various levels of boron in the nutrient solution on the water relations of the tobacco variety Little Turkish [cf. *R.A.M.*, 28, p. 642] was studied at Manhattan, Kansas. Water absorption and moisture content increased from a low level with no boron to a maximum at 1 and 4 p.p.m. boron and declined again at higher rates. Plants given the intermediate amounts produced the greatest dry weights though showing toxicity symptoms.

Strzemska (Mme J.). **Bibliografia prac z zakresu mikoryzy lata 1758–1953.** [Bibliography of the works in the field of mycorrhiza from 1758–1953.] —*Acta microbiol. polonica*, 3, 2, pp. 155–194, 1954.

This bibliography of the literature on mycorrhiza includes 1,093 titles of papers written, both in Poland and abroad, during the period between 1758 and 1953.

Ramakrishnan (T. S.) & Damodaran (A. P. S.). **Fruit rot of Nutmeg.**—*Indian Phytopath.*, 7, 1, pp. 7–17, 2 pl., 1954.

In 1953, a disease affecting semi-mature fruits of nutmeg (*Myristica fragrans*) [*R.A.M.*, 28, p. 419] occurred during the monsoon months (August to October) in a garden near Burliar, India, at about 2,500 ft. above sea-level. Affected fruits rotted, the rind disintegrated, the tissues became discoloured, the pericarp split prematurely, and several fruits dropped. When the disease spread to the mace and seed, these too, rotted and became enveloped by greyish mycelium. The main rotting agent was found to be *Diplodia natalensis* [cf. 34, p. 232]. In inoculation experiments the fungus, isolated from fruits, attacked wounded and unwounded

immature nutmeg fruits, young orange and castor fruits, onion shoot bases, sweet potato tubers, and groundnut pods. A *Gloeosporium* sp. isolated at the same time affected only wounded nutmeg fruits. The intensity of pycnidial formation in culture and the dimensions of the pycnidia of *D. natalensis* depended on the medium or the host. As a control measure the pruning of affected twigs and spraying with Bordeaux mixture is recommended, as well as the eradication of sources of infection.

Bourne (B. A.). **Antibiosis and the red rot disease of Sugar Cane.**—*Phytopathology*, 45, 1, pp. 37–38, 1 fig., 1955.

In the course of a recent study on the dissemination of sugar-cane diseases [*R.A.M.*, 33, p. 381] a yeast identified as *Candida intermedia*, which is associated internally and externally with the sugar-cane moth borer (*Diatraea saccharalis*) and one of its parasites, *Agathis stigmaterus*, in the Florida Everglades was found to be strongly antagonistic to the causal organism of red rot, *Physalospora* [*Glomerella*] *tucumanensis*. No comparable action was exerted on *Fusarium moniliforme* [*Gibberella fujikuroi*: loc. cit.], a frequent concomitant of *Glomerella tucumanensis* in diseased tissues. The results of *in vitro* tests by a method similar to that of Cooper and Chilton [29, p. 583] suggested the possible utilization of *C. intermedia* for red rot control by cultivating it on sterile cane juice or dilute final molasses for the inoculation of cuttings or toxin production.

Knust (H. G.). **Notes on the heat treatment of Cane plants at the Bundaberg Sugar Experiment Station.**—*Cane Gr. quart. Bull.*, 17, 1, pp. 33–36, 2 figs., 1953.

This information on the heat treatment of sugar-cane varieties against the ratoon stunting disease [see next abstract] has already been noticed from another source [*R.A.M.*, 32, p. 645].

King (N. J.). **The ratoon stunting disease problem.**—*Cane Gr. quart. Bull.*, 17, 1, pp. 10–13, 1953.

Most of this information on the occurrence of sugar-cane ratoon stunting disease in Queensland [see preceding abstract], its spread, and its control has already been noticed in this *Review* [*R.A.M.*, 33, p. 320].

Joshi (N. C.). **Chemotherapy against Sugar Cane diseases.**—*Indian Sug.*, N.S., 4, 7, p. 343, 1954.

In 1951–2 and 1952–3 experiments were performed at the Government Sugar Cane Research Station, Shahjahanpur, Uttar Pradesh, India, to determine the effect on red rot (*Colletotrichum falcatum*) [*Glomerella tucumanensis*], wilt (*Cephalosporium sacchari*) [*R.A.M.*, 34, p. 322], and smut [*Ustilago scitaminea*] in the Co. 453 sugar-cane variety of soil amendments with six chemicals. Bordeaux mixture, Burgundy mixture, sulphur, dithane [containing zineb], fermate [containing ferbam], and borax were applied at the time of sowing and after six months 50 canes were inoculated in each test. Four months later the results were assessed. In the two experimental seasons the amounts of linear infection due to *G. tucumanensis* were reduced by sulphur from 46·3 and 44·6 to 18·3 and 17·8 cm., respectively, the corresponding figures for *C. sacchari* being from 23·6 and 22·5 to 15·8 and 14·2 cm., respectively. On the other hand, Bordeaux mixture gave better control of *U. scitaminea* than did sulphur, reducing the number of diseased 'whips' from 4 and 6 to 1 and 0, respectively. In 1951–2 dithane, fermate, and borax completely eliminated smut, the first-named being equally toxic to the pathogen in 1952–3, when the other two chemicals permitted the development of one and three diseased 'whips', respectively.

Magni (G. E.). **Genetical and biophysical methods of research for studies on the systematics of fungi.**—*Atti Ist. bot. Pavia*, Ser. 5, 10, 2–3, pp. 201–210, 2 graphs, 1954. [Received 1955.]

In this paper, read at the Sixth International Congress of Microbiology, at Rome, 1953, the author discusses (with 17 references to the literature) the application of genetic criteria to the classification of yeasts [*R.A.M.*, 28, p. 298]. The points dealt with include the importance of the haploid and diploid phases in the life-cycle of sporogenous yeasts, ploidy in asporogenous yeasts, and mutability as a systematic character.

Ciferri (R.). **A few critical Italian fungi.**—*Atti Ist. bot. Pavia*, Ser. 5, 10, 2–3, pp. 237–251, 2 figs., 1954. [Received 1955.]

A study at the Botanical Institute and Italian Cryptogamic Laboratory, University of Pavia, of *Botryosphaeria marconii* [*R.A.M.*, 25, p. 493] showed that in addition to the ascogenous state it possesses stromatic and non-stromatic pycnidia with hyaline, continuous or 1-septate microconidia, and macroconidia on very short (almost papillate) to conspicuous, simple or branched conidiophores.

The genus *Limnomyces* Lohammar (*Svensk bot. Tidskr.*, 47, 4, pp. 526–529, 1953), parasitic on leaves of *Elatine triandra* in Italy and elsewhere, is confirmed; the morphological appearance of the fungus is that of a species of the Protomycetaceae.

The new genus *Ribaldia* is proposed for *Leptothyrium coryli* [see below, p. 556]. The new genus *Fulvia* is proposed for *Cladosporium fulvum*; it is segregated from the other species of *Cladosporium* as being truly parasitic (on tomato), forming pale colonies in culture, having perfectly smooth conidia, and being difficult to cultivate in laboratory media. Sporodochial and pseudopycnidial stages are described for *Gloeosporium musarum* [*R.A.M.*, 32, p. 634]. It was probably the sporodochial stage that was described as *Hymenula musae* (Patouillard & Lagerheim, *Bull. Soc. mycol. Fr.*, 8, p. 138, 1892), the diagnosis agreeing perfectly with the writer's observations.

Thompson (A.) & Johnston (A.). **A host list of plant diseases in Malaya.**—*Mycol. Pap. Commonw. Mycol. Inst.* 52, 38 pp., 1953. 10*s.*

This list of plant diseases in Malaya includes records published since 1920 and unpublished observations made mainly between 1946 and 1950. The diseases are arranged under the alphabetically listed botanical names of the hosts, the incidence of each disease being indicated. There is a bibliography of 165 titles and an index of Latin names of organisms (fungi, bacteria, algae, and nematodes) and of references to virus diseases and non-parasitic disorders.

Wiehe (P. O.). **The plant diseases of Nyasaland.**—*Mycol. Pap. Commonw. Mycol. Inst.* 53, 39 pp., 4 graphs, 1 map, 1953. 10*s.*

This annotated list of plant diseases in Nyasaland [cf. *R.A.M.*, 32, p. 669 and next abstract] is based on observations and collections made by the writer during 1949 and 1950, and includes diseases caused by fungi, bacteria, and viruses and physiological disorders arranged alphabetically under each host, indexes being provided to hosts and diseases. New records for Nyasaland include *Cercospora oryzae* on rice [C.M.I. map No. 71] and *C. concors* in potato [No. 112].

Bisby (G. R.) & Wiehe (P. O.). **The rusts of Nyasaland.**—*Mycol. Pap. Commonw. Mycol. Inst.* 54, 12 pp., 1953. 3*s.* 9*d.*

A short introduction lists the more important papers on the Uredinales of Africa. The list of species includes 120 entries with hosts, localities, and brief notes. Ten new species were found in Nyasaland [see preceding abstract], but all these were described by Cummins [*R.A.M.*, 31, p. 402]. About 40 of the rusts are on grasses, including *Puccinia coronata* on oats, *P. penniseti* on *Pennisetum typhoides* and other

grasses, *Puccinia polysora* and *P. sorghi* on maize, and *P. triticina* on wheat. Nearly all the species are first records for Nyasaland and include also *Cerotelium fici* on fig, *P. antirrhini* on *Antirrhinum*, *P. pruni-spinosae* on stone fruits, *Uromyces striatus* on lucerne, and *U. vignae* on *Vigna* and other legumes.

Meier (H.) & Webster (J.). **An electron microscope study of cysts in the Saprolegniaceae.**—*J. exp. Bot.*, 5, 15, pp. 401–409, 4 pl., 1954.

At the Botany Department, Sheffield University, electron microscope studies of zoospore cysts of the Saprolegniaceae suggested that the structure of the membranes and types of hooks present may serve as useful taxonomic criteria. For example, in *Saprolegnia parasitica* the primary cysts bear simple hairs, longer than those in *S. ferax* and *S. dioica*, while the secondary cysts possess tufts of thin hooked hairs, from four to 13 in each tuft.

Dennis (R. W. G.). **Some inoperculate discomycetes of tropical America.**—*Kew Bull., 1954*, 2, pp. 289–348, 56 figs., 1954.

Descriptions are given, with keys, of some inoperculate discomycetes from Central America and the West Indies, including collections from Trinidad, Venezuela, and Jamaica made by the author in 1949. One new genus, seven new species, two new varieties, 18 new combinations, and three new names are proposed.

Pinto-Lopes (J.). **Polyporaceae de Portugal (excepto resupinadas). Revisão das coleccões portuguesas.** [Polyporaceae of Portugal (except resupinates). Revision of the Portuguese collections.]—*Rev. Fac. Ciênc. Lisb.*, Sér. 2, C, 3, 1, pp. 157–237, 1953. [Received April, 1955.]

This is a critically annotated list of the non-resupinate Polyporaceae of Portugal, much of the information in which has already been presented [*R.A.M.*, 32, p. 513]. Additional records of phytopathological interest include *Coriolus* [*Polystictus*] *versicolor*, *Ganoderma applanatum*, *Leptoporus* [*Polyporus*] *adustus*, *Phaeolus* [*Polyporus*] *schweinitzii*, *Phellinus* [*Fomes*] *robustus*, *P.* [*F.*] *salicinus*, *P. torulosus*, and *Ungulina fomentaria* [*F. fomentarius*] on *Acacia* spp.; *F. salicinus* on alders; *F. igniarius* ssp. [var.] *fulvus* and *P. torulosus* on almond; *Polystictus versicolor*, *G. applanatum*, *F. salicinus*, and *Phellinus torulosus* on *Arbutus unedo*; *G. applanatum* and *P. torulosus* on box; *Polystictus versicolor*, *G. applanatum*, *G. lucidum* var. *resinaceum*, *Phellinus torulosus*, and *Polyporus sulphureus* on chestnut; *G. applanatum* and *Phellinus torulosus* on citrus, the latter also on quince; *G. lucidum* and its var. *resinaceum* on loquat; *Polystictus versicolor*, *G. applanatum*, *Polyporus adustus*, *F. salicinus*, and *F. fomentarius* with its var. *nigricans* on *Eucalyptus* spp.; *G. lucidum* var. *resinaceum* on fig; *Polyporus schweinitzii*, *Phellinus torulosus*, *Trametes hispida* [*T. trogii*], and *Ungulina ulmaria* [*F. ulmarius*] on various kinds of ash; *Xanthocrous* [*Polyporus*] *hispidus* on walnut and mulberry; *Polystictus versicolor* and *F. salicinus* on olive; *G. applanatum*, *Polyporus schweinitzii* and *X.* [*F.*] *pini* on pines; *F. igniarius* var. *fulvus*, *F. salicinus*, and *Phellinus torulosus* on pear; *F. igniarius* var. *fulvus* and *P. torulosus* on apple; *Phellinus* [*F.*] *robustus*, *P. torulosus*, and *U. ochroleuca* [*Polyporus ochroleucus*] on *Pistacia lentiscus*; *Polyporus sulphureus*, *F. ulmarius*, and *P. hispidus* on *Platanus orientalis*; *G. lucidum* var. *resinaceum*, *F. igniarius*, *F. salicinus*, *Polyporus sulphureus*, *T. trogii*, *F. fomentarius*, and *F. ulmarius* on poplars; *F. igniarius* var. *fulvus*, *F. robustus*, and *Phellinus torulosus* on apricot; *Polystictus versicolor* and *F. igniarius* var. *fulvus* on cherry and plum, accompanied on the latter by *Phellinus torulosus* and *Polyporus hispidus*; *Polystictus versicolor*, *F. igniarius* var. *fulvus*, and *F. fomentarius* on peach; *Polyporus ochroleucus* and *P. cuticularis* on *Quercus ilex*; *Polystictus versicolor*, *G. applanatum*, *G. lucidum* and its var. *resinaceum*, *Lenzites quercina*, *F. ulmarius*, and *Polyporus hispidus* on oaks and cork oak (*Q. suber*); and

G. applanatum, *P. schweinitzii*, *T. trogii*, *F. fomentarius*, *F. ulmarius*, *P. hispidus*, and *X.* [*F.*] *ribis* on elm.

Müller (E.) & Menon (Radha). **Bagcheea, eine neue Gattung der Sphaeriales aus Indien.** [*Bagcheea*, a new genus of the Sphaeriales from India.]—*Phytopath. Z.*, **22**, 4, p. 417–420, 2 figs., 1954.

In the spring of 1954 the second author found a new ascomycete parasitizing the leaves of *Castanea* sp. in India. The name *Bagcheea castanea* n.g., n.sp. is proposed for this species.

The perithecia, growing in the amphigenous leaf spots, are solitary, immersed, globose, 200 to 250 μ in diameter; the stromata are covered by a dark epidermal clypeus; the hyphae inside the leaf are hyaline. The ostiole is erumpent, composed of brownish hyphae. The asci, each containing four spores, are cylindrical or ellipsoid, thin-walled, the apex truncated, filling the whole fructification, 50 to 80 by 10 to 14 μ. The ascospores are hyaline, unicellular, polar-diblastic, 21 to 24 by 7·5 to 9 μ. Paraphyses are absent.

The fungus produces on the leaves of *Castanea* grey, necrotic spots with brown margins, about 1 cm. across, with circular stromata of about 500 μ in diameter on the upper leaf surface.

Ramakrishnan (T. S.) & Sundaram (N. V.). **Notes on some fungi from South India.—III.**—*Indian Phytopath.*, **7**, 1, pp. 61–68, 1 pl., 1954.

In this annotated list of 11 fungi found in South India [cf. *R.A.M.*, **33**, p. 636] *Phyllactinia corylea* is reported as causing considerable damage to mulberry [*R.A.M.*, **25**, p. 17]; control with Bordeaux mixture or lime-sulphur is difficult as the fungicides affect the health of silkworms. *Phyllachora dolichogena* on leaves of *Dolichos lablab* is a new record for India. The incidence of *Exosporium arecae* on areca leaves is high during the rainy months. *Septoria apii-graveolentis* [**23**, p. 151] is recorded on wild celery.

Narasimhan (M. J.) & Thirumalachar (M. J.). **A Sclerotinia disease of Orobanche cernua in Bihar (India).**—*Phytopath. Z.*, **22**, 4, pp. 421–428, 6 figs., 1954.

Orobanche cernua, the broomrape or 'tokra', is a flowering parasite on tobacco plants in India; at Patna, Bihar, it is a major pest of eggplant, tomato, mustard, cabbage, cauliflower, and turnip.

A species of *Sclerotinia* was found to be widespread, causing a wet rot of the flowering scape of the broomrape without in any way affecting its hosts. The fungus grows readily in artificial culture at an optimum temperature of 18° to 20° C., developing numerous black sclerotia. The life-cycle comprises no conidial state but hyaline microconidia up to 2 μ in diameter are produced on sporodochia. Germination of the sclerotia, the production of apothecia, and the discharge of ascospores was induced by a preliminary drying at 24° for 8 to 10 days and subsequent exposure in a moist atmosphere with damp sawdust as a substratum.

In a limited number of inoculation experiments, the fungus infected exclusively *Orobanche*, but not its hosts. The apothecial state was completed from a single uninucleate ascospore. The fungus resembles *S. sclerotiorum* and is presented as a new form, forma *orobanches*. *Sclerotium orobanches* reported from Europe and America on *Orobanche* may prove to be the vegetative state of this *Sclerotinia*.

De Jong (P.). **Recent developments in the control of blister blight of Tea in South India.**—*Plant Prot. Overseas Rev.*, **4**, 2, pp. 58–63, 2 pl., 1954.

This information concerning the control of tea blister blight (*Exobasidium vexans*) in southern India from 1951 to 1953 has already been noticed from other sources [*R.A.M.*, **33**, p. 262; **34**, p. 66].

Homburg (K.). **Enige resultaten van de blisterblight bestrijdingsproeven in het Patuha'se.** [Some results of the blister blight control experiments in the Patuha area.]—*Bergcultures*, 24, 7, pp. 169, 171, 172–173, 175–177, 179, 181, 183, 185, 4 figs., 4 graphs, 1955. [English and Indonesian summaries.]

The results of experiments on the control of blister blight (*Exobasidium vexans*) of tea in the Patuha region of Sumatra [*R.A.M.*, 32, p. 514; 33, p. 565] during 1954 are described and information already presented on cultural and environmental factors in relation to the disease is recapitulated. A negative correlation was established between the number of hours of morning sunshine and the incidence of infection in various parts of the estate. Thus, on an area situated 1,600 m. above sea-level, exposed to 80 per cent. morning sunshine, taking 100 per cent. as six hours, the critical limit for an attack is three hours. Elsewhere the limit is proportional to the total attainable number of hours of sunshine. The average relative humidity curve is almost identical on different parts of the estate and cannot, therefore, be used as a criterion of susceptibility in an individual garden.

Copper oxychloride maintained its reputation as the best fungicide available. Intervals between applications should not exceed six to seven days for spraying and four to five for dusting. Mention is made of two new dusting machines, the Aeolus and the Teeveeka, the former driven by a motor and the latter by the power take-off from the Bristol D20 tractor.

Tolhurst (J. A. H.). **Magnesium and manganese deficiencies in the nutrition of the Tea bush.**—*Tea Quart.*, 25, 4, pp. 84–86, 1954.

Studies in Ceylon have revealed that tea bushes there are subject to both magnesium and manganese deficiency [cf. *R.A.M.*, 32, p. 455]. Shortage of magnesium causes the old leaves to become pale, dull, and brittle and sometimes markedly folded upwards along the midrib. A diffuse yellowish-brown to coffee-coloured mottling, appearing as a vague mosaic between the main veins and towards the leaf centre, occurred consistently [20, p. 497]. The condition was confirmed by leaf analyses. Trials with 2 per cent. magnesium sulphate sprays plus a wetter are under way.

Manganese deficiency was characterized by yellowing on both young and old leaves between the main veins and in severe cases by a narrow yellow band at the leaf edge. These areas were irregularly shaped and well marked. Flush was retarded and the leaves were small, dark, and hard. The condition was caused by the burning of weeds in proximity to the bushes, resulting in the raising of the soil pH above 6. It was alleviated by a single spray of 0·2 per cent. manganese sulphate plus a wetter. There were indications that the soil in question was initially low in manganese.

Franklin (Rosalind E.). **Structure of Tobacco mosaic virus.**—*Nature, Lond.*, 175, 4452, pp. 379–381, 3 figs., 1955.

Following a brief summary of the recent literature on the chemical structure of the tobacco mosaic virus, much of which supports the hypothesis of the existence in the virus of a protein-building unit of molecular weight between 10,000 and 20,000, X-ray diffraction studies carried out at the Crystallography Laboratory, Birkbeck College, London, are described. These indicate that the protein of tobacco mosaic virus [cf. *R.A.M.*, 33, p. 763; 34, p. 489] is in the form of units with a molecular weight of about 29,000, arranged on a helix of pitch 23 Å, there being $3n+1$ units on three turns of the helix, the value of n probably being 12.

The units are subdivided in a plane approximately perpendicular to the axis of the helix, forming near-equivalent sub-units of molecular weight consistent with the minimum molecular weight obtained by chemical methods. A large external surface is given to the virus by a series of external grooves caused by structural

discontinuity between one turn of the helix and the next. This possibly accounts for the variety of chemical modifications possible in this virus without breaking up the particle or destroying its infectivity.

Laloraya (M. M.) & Jee (G.). **Effect of 'Tobacco leaf-curl' and Tobacco mosaic virus on the amino-acid and amide content of Nicotiana sp.**—*Nature, Lond.*, 175, 4464, pp. 907–908, 1955.

In the Department of Botany, University of Allahabad, India, a study by a modified technique of horizontal paper chromatography of free and hydrolysed protein of healthy tobacco leaves and those infected with tobacco mosaic virus and others with leaf curl virus revealed the absence of a ninhydrin-reacting substance from the diseased leaves and the presence on the chromatogram of two new bands corresponding to asparagine and histidine-lysine [cf. *R.A.M.*, 33, p. 264].

Koch (L. W.) & Patrick (Z. A.). **Rootrot investigations in Ontario.**—*Lighter (Dep. Agric., Can.)*, 23, 3, pp. 16–18, 1953.

A considerable alteration in the tobacco disease situation in Canada has taken place in the past five years. Black root rot [*Thielaviopsis basicola*] is much less prevalent and brown root rot [caused by nematodes: *R.A.M.*, 34, p. 492] is increasing in importance. tobacco etch virus is now more serious than mosaic, whilst only a few outbreaks of blue mould [*Peronospora tabacina*] have been reported from Ontario and none from Quebec. In marginal areas in Ontario frenching is of economic importance and studies are in progress at the Harrow Laboratory on the soil phytotoxins which cause various unthrifty symptoms in tobacco and other crops.

Kincaid (R. R.) & Gammon (N.). **Incidence of Tobacco blackshank directly related to soil pH.**—*Plant Dis. Reptr*, 38, 12, pp. 852–853, 1954. [Multilithed.]

In experiments at a Florida agricultural experiment station the incidence of tobacco black shank (*Phytophthora parasitica* var. *nicotianae*) [*R.A.M.*, 33, p. 324; 34, pp. 109, 326, 404] on the susceptible variety No. 870 increased with each increment of soil pH. adjusted with elemental sulphur and hydrated lime to five levels ranging from 4·3 to 6·4, until near the end of the season, when most of the plants were killed except at the lowest pH. This correlation was found to be higher than that between the disease and exchangeable calcium, but both were highly significant. Incidence on the resistant Dixie Shade, though low, showed a similar trend.

The critical pH for black shank was 5·2 and a slightly higher level is recommended for breeding plots, where early and complete elimination of susceptible plants is required.

Stephen (R. C.). **Frog eye and barn spot disease of Tobacco.**—*S. Afr. J. Sci.*, 51, 10, pp. 298–300, 1955.

Tobacco leaf spot (*Cercospora nicotianae*) [*R.A.M.*, 29, p. 511] was studied in the field in Southern Rhodesia and in humidity cabinets simulating barn conditions at the Tobacco Research Board, and also during curing. Yellowing at 100° F. and 100 per cent. humidity led to markedly less spot than at 90° and 85 per cent. humidity, the factors being independent of each other. The incidence of barn spot stands in direct relation to the nitrogen supply to the plant; the relation, however, becomes inverse when the incidence is kept in check by higher temperature and humidity.

Bovey (R.). **Les maladies à virus de la Tomate.** [Virus diseases of the Tomato.]—*Rev. rom. Agric.*, 9, 2, pp. 17–19, 4 figs., 1953.

Brief notes are given in popular terms on the symptoms, mode of spread, and

control of the chief virus diseases of tomato found in Switzerland or the neighbouring countries, viz., mosaic (tobacco mosaic virus) [cf. *R.A.M.*, 32, p. 40; 34, p. 212], the most prevalent virus disease of this host in the Valais district; spotted wilt, not very commonly found; cucumber mosaic; and potato virus X [loc. cit.].

Best (R. J.). **Cross protection by strains of Tomato spotted wilt virus and a new theory to explain it.**—*Aust. J. biol. Sci.*, 7, 4, pp. 415–424, 3 pl., 1954.

In this further, expanded account of work at the Waite Agricultural Research Institute, Adelaide, South Australia, on cross-protection by strains of tomato spotted wilt virus [*R.A.M.*, 33, p. 702], it is stated that unpublished results by the author and H. P. C. Gallus have shown that it is possible to separate from tomato, *Nicotiana glutinosa*, and tobacco plants infected with two strains of the virus, strains which differ from both the originals, and yet combine some of the characters of each. The fact that the new strains remain true to type on further serial transfer eliminates a possible alternative explanation, namely, that the difference in symptoms between 'protected' plants (with mixed infections) and those infected by single strains only is due entirely to changed reaction of the host without any change in the virus particle.

Kern (H.) & Sanwal (B. D.). **Untersuchungen über den Stoffwechsel von Fusarium lycopersici mit Hilfe von radioaktivem Kohlenstoff. Vorläufige Mitteilung.** [Investigations on the metabolism of *Fusarium lycopersici* by means of radioactive carbon. Preliminary note.]—*Phytopath. Z.*, 22, 4, pp. 449–453, 2 figs., 2 graphs, 1954.

At the Federal Technical Institute, Zürich, Switzerland, a series of experiments by means of radioactive carbon to study the metabolism of *Fusarium* [*bulbigenum* var.] *lycopersici* [cf. *R.A.M.*, 34, p. 493] led to the following preliminary conclusions: (1) the mycelium and conidia of the fungus can be rendered radioactive and made visible in an auto-radiogram; (2) the germinative power of the conidia was negatively correlated with the radioactivity of the medium, decreasing at 110 μC per ml. to 50 per cent. in seven days, and where radioactivity was constant it decreased with time, after twelve days being reduced to 65 per cent.; (3) mycelium grown on a radioactive substratum maintained its pathogenicity and it was possible to inoculate labelled mycelium into tomato plants and to observe the metabolism of the fungus within the infected plant; (4) radioactive metabolites of the fungus could be observed in various parts of the plant where mycelium was not present after varying periods of time.

Waggoner (P. E.) & Dimond (A. E.). **Production and role of extracellular pectic enzymes of Fusarium oxysporum f. lycopersici.**—*Phytopathology*, 45, 2, pp. 79–87, 4 graphs, 1955.

In studies at the Connecticut Agricultural Experiment Station on the extracellular pectic enzymes of *Fusarium oxysporum* f. [*F. bulbigenum* var.] *lycopersici* in relation to the tomato wilt syndrome [*R.A.M.*, 33, p. 747], the fungus excreted pectin methylesterase but not polygalacturonase in cultures on glucose media. Both enzymes were produced on a pectin medium, the maximum enzyme concentrations and mycelial mat weights being reached at about the same time, i.e., after three days in shake and ten in quiet cultures. Polygalacturonase disappears from the substratum more rapidly than pectin methylesterase.

The two enzymes can be adsorbed on celite and eluted separately with a measure of purification. The characteristics of the polygalacturonase of *F. b.* var. *lycopersici* agree in the main with those of the same enzyme from other fungi, but the pectin methylesterase is exceptional in its relative activity at pH 7. The polygalacturonase is more active on pectin in the presence of pectin methylesterase, but the latter

does not reduce the viscosity of pectin nor macerate tomato stem tissue in the absence of the former. The polygalacturonase produces galacturonic acid. The pectin methylesterase of the pathogen, and probably its polygalacturonase, are present in the vascular stream of wilted tomato plants and are doubtless active during pathogenesis.

Preparations of the enzymes hitherto made by the authors and others [loc. cit.] have not been fully purified and may harbour contaminants, e.g., viable spores. Therefore, their action on tomato cuttings cannot be regarded as a demonstration of the function of pectic enzymes in the inducement of wilt.

YOUNG (P. A.). **Experimental control of southern blight on Tomato.**—*Plant Dis. Reptr*, 38, 12, p. 858, 1954. [Multilithed.]

In 1954 experiments were carried out by the Texas Agricultural Experiment Station and the Shell Chemical Company for the control of southern blight (*Sclerotium rolfsii*) of tomatoes [*R.A.M.*, 34, p. 190]. Towards the end of March chlorobromopropene (3 per cent., emulsified with triton in $2\frac{2}{3}$ gals. water or 4·5 per cent. in 4 gals.) was sprinkled on the soil in metal-bordered plots, each 24 sq. ft., in a naturally contaminated field, each application being followed immediately by an equal volume of water to wash the fungicide deeper into the soil. Manasota tomatoes were planted on 27th April. By July none of the plants in the treated plots showed any symptoms, while 18 per cent. of those in the control plots (sprinkled with water only) and 45 per cent. in an adjacent row were killed. Treated plants were much larger than the untreated.

GALLEGLY (M. E.) & MARVEL (M. E.). **Inheritance of resistance to Tomato race 0 of Phytophthora infestans.**—*Phytopathology*, 45, 2, pp. 103–109, 1955.

In further studies at the West Virginia Agricultural Experiment Station on physiologic specialization in *Phytophthora infestans* on tomato [*R.A.M.*, 32, p. 403] two types of resistance to the common race, herein designated 0 (T_0), were found. The first, controlled by one or more dominant genes and inherited on simple Mendelian lines, was present in West Virginia accessions 36 and 106. Plants harbouring this factor developed small, necrotic, localized spots. The second type, depending on multiple or minor genes, resulted in the formation of atypical, sparsely sporulating lesions, about $\frac{1}{2}$ in. in diameter on plants inoculated at the age of four to six weeks. This form of resistance was found to a varying extent in West Virginia accessions 19 and 731–1, as well as in the Southland and Wisconsin 55 varieties.

The dominant genotypes were susceptible to a specialized race 1 (T_1), to which West Virginia accessions 700 and 915 proved to be resistant. The results of a preliminary test with the F_2 of Marglobe × 700 suggested that one or more dominant genes may reside in the latter parent. The single dominant gene in accession 106 was named TR_1.

FISHER (DOROTHY E.). **Stem and fruit rot of outdoor Tomatoes.**—*Rep. nat. Veg. Res. Sta., Warwick, 1953*, pp. 15–16, 1954.

In preliminary studies at the National Vegetable Research Station, Wellesbourne, hyphae and pycnidia of *Didymella lycopersici* [*R.A.M.*, 33, p. 266] were found immediately inside the outer hairy coat of infected tomato seeds. Treatment with 20 per cent. sodium carbonate or 1·5 per cent. hydrochloric acid killed cultures of the fungus on agar disks: when seed was extracted from the fruit with 1·5 per cent. hydrochloric acid, however, some of it remained infected. Isolates of *D. lycopersici* from tomato infected *Solanum nigrum* in wound inoculations and an isolate from potato proved pathogenic to tomato, but attempts to inoculate

actively growing potatoes with a tomato isolate were unsuccessful. [An abridged version of this paper appears in *Nature, Lond.*, 174, 4431, pp. 656–657, 1 fig., 1954.]

CRITOPOULOS (P. D.). **Foot rot of Tomato incited by Phytophthora capsici.**—*Bull. Torrey bot. Cl.*, 82, 3, pp. 168–182, 7 figs., 1 graph, 1955.

Mature tomato plants at Stockton, California, were affected by foot rot caused by *Phytophthora capsici* [*R.A.M.*, 34, p. 326]. At the Department of Plant Pathology, University of California, Berkeley, the fungus caused a basal stem rot when the mycelium was added to the soil around the stems of young or semi-mature, unwounded, potted Bonny Best tomato plants. Small, unwounded, immature fruits developed firm, diffuse brown spots at the inoculation site, each surrounded by a broad, water-soaked, light brown border, with an ill-defined margin. Mature fruits were not readily infected but decay, once initiated, proceeded more rapidly than in immature. There was sometimes a brownish diffuse discoloration at the inoculation site, generally surrounded by a water-soaked, slightly depressed border, sharply demarcated from the healthy tissue. About eight days after inoculation the lesions were covered by sporangia and the fruits became soft.

The fungus was pathogenic to young, unwounded, potted kidney bean (*Phaseolus vulgaris*) plants, and to young or mature sweet pepper (*Capsicum frutescens*), and pea plants. Two remarkable features were the non-motility of most of the zoospores and their fusion in pairs.

It was demonstrated that the pathogen could survive for five months in moist soil in the absence of the host.

MONTGOMERY (NANCY). **Damping-off of Tomato by species of Pythium and its control by use of formalin dust.**—*J. hort. Sci.*, 29, 4, pp. 245–257, 2 figs., 1954.

At the Plant Pathology Laboratory, Imperial College, London, isolations from damped-off tomato plants grown in five field soils of various textures and in compost, all with no known previous history of tomato cultivation, demonstrated the prevalence of *Pythium debaryanum* and *P. intermedium* [cf. *R.A.M.*, 31, p. 623] as causal agents. Both fungi were active in causing damping-off at temperatures of 15° C. or less and relatively inactive above 20°, whereas *Phytophthora parasitica* [33, p. 188] behaved conversely in this respect. The *Pythium* spp. invade the host through the cotyledons, which are most susceptible while still in the seed coat. At lower temperatures considerable pre-emergence damping-off may thus occur, followed later by root injury. Losses due to *Pythium* spp. are most likely to affect the small-scale grower or amateur gardener, using unsterilized or inadequately sterilized composts, or ones contaminated after sterilization, and failing to control the temperature at sowing time. Good control of damping-off in soils naturally contaminated or inoculated with the two *Pythium* spp., *Phytophthora parasitica*, and *Rhizoctonia* [*Corticium*] *solani* was achieved by incorporating 0·4 per cent. formaldehyde adsorbed on air-dried soil [cf. loc. cit.: 11, p. 409] in the soil immediately before sowing or, with a sufficient aeration period, before pricking out.

DEL CHIARO (G.). **Ricerche su alcuni caratteri colturali e fisiologici dell'agente della 'pellagra' del Pomodoro.** [Studies on some cultural and physiological characteristics of the agent of 'pellagra' of Tomatoes.]—*Ann. Sper. agr.*, N.S., 8, 2, pp. 431–446, 9 figs., 1 graph, 1954.

Experiments at the Plant Pathology Institute, University of Pisa, demonstrated that *Alternaria solani*, the agent of 'pellagra' or alternariosis of tomatoes [*R.A.M.*, 33, p. 567], grows and sporulates better on solid than on liquid media. The organism utilized peptone and sodium nitrate as nitrogen sources and all the sugars except maltose as carbohydrate sources. Growth was best at about pH 5 and at an isometabolic point of 7·2 to 7·5 on Czapek-Dox agar. Abundant normal-shaped

conidia were produced in ordinary light but in darkness or variously coloured light the conidia were malformed or dwarfed.

The growth of the pathogen was arrested on Czapek-Dox or bean agar media to which uspulun, agrosan GN, granovit, and sesan at 1 and 2 per cent. were added. In no case did these compounds interfere with the germination of the seed of various tomato varieties tested.

McNabb (H. S.). **The status of Oak wilt in Iowa.**—*Proc. Iowa Acad. Sci.*, 61, pp. 141–148, 1954. [Received June, 1955.]

Most of this information concerning the research on oak wilt (*Chalara quercina*) [*R.A.M.*, 34, pp. 327, 411] in Iowa since 1932, taken from the literature (35 titles), has already been noticed in this *Review*.

Ribaldi (M.). **Maculatura fogliare del Nocciolo spontaneo causata da Cylindrothyrium coryli (Leptothyrium coryli Fuck.) n. comb., con osservazione biologiche e sistematiche sul fungo.** [Leaf spot of the wild Hazel caused by *Cylindrothyrium coryli* (*Leptothyrium coryli* Fuck.) n. comb., with biological and systematic observations on the fungus.]—*Ann. Sper. agr.*, N.S., 7, 6, pp. 1914–1956, 3 pl., 3 figs., 1953. [English summary.]

In August, 1950, a leaf spot was observed on young *Corylus avellana* var. *silvestris* plants growing in brushwood at Valsalice and Colle della Maddelena, near Turin, Italy. The disease spread to Pino, Cavoretto, and Stupinigi, and in September, 1952, was very severe on the hills at Valsalice and Colle della Maddelena, almost all the leaves on numerous plants becoming affected and many of them falling prematurely.

Towards the middle of August small, circular or nearly circular, yellowish or greyish spots, particularly numerous on the lower leaves, appeared. They enlarged rapidly to 5 to 20 mm. in diameter, developed a sinuous outline, became umber to reddish-brown, frequently with concentric zones more conspicuous on the lower than on the upper surface, and were often delimited by a darker rim and surrounded by a pale green to straw-yellow halo merging gradually into the green of the surrounding healthy tissue. The spots were generally isolated, but sometimes became confluent and formed large discoloured areas. As a rule the lesions were situated along the primary and secondary veins. The black fructifications of the causal fungus were visible on the lower surface. Sometimes the dead tissue became torn. The disease can be found even in November in small valleys where conditions favour the prolonged growth of the host.

Drops of water are necessary for the normal dispersal of the conidia. This explains the appearance and spread of the disease. The rainfall for August in each of the years 1950, 1951, and 1952 was about double that for August, 1947 and 1948, and five times that for August, 1949. Further, June and July, 1952, were marked by high temperatures, bright sunshine, and very little rain. These factors probably reduced host resistance, with the result that when rain fell in August fungal attack was facilitated; subsequent rains favoured spread.

In the leaf, straight or serpentine, septate hyphae, 2 to 6 μ in diameter, were present; the pseudopycnidia when covered by the leaf cuticle were hemispherical, shining, somewhat turgid swellings with a round, ellipsoidal, triangular, quadrangular, or irregularly polygonal base; they were 50 to 200 μ wide and 40 to 70 μ high. At first greenish-yellow, they later became brown, or sometimes black. The fruiting basal stroma was 10 to 20 μ thick. The upper layer of smaller cells produced short, straight or flexuose, simple, continuous or septate, hyaline conidiophores measuring 5 to 20 by 1·5 to 3·5 μ, bottle-shaped or elongated conical; sometimes they were verticillate-ramose, flagon-shaped, and measured 4 to 8 by 1·5 to 2 μ. They bore at the apex scolecoid, straight, flexuose, or slightly curved, hyaline

conidia measuring 8 to 22 by 1 to 2 (mostly 18 by 1) μ. The conidia collect in the subcuticular cavity, held together by a mucilage, and later emerge through the stoma or through cracks as mucilaginous plugs, cirrhi, or shapeless masses.

The fungus is considered to be identical with *Leptothyrium coryli* [*R.A.M.*, 13, p. 424], but because it has scolecoid conidia is transferred to *Cylindrothyrium* as *C. coryli* n.comb. (syn. *L. corylinum*).

WIEHE (P. O.). **Leaf spot of Aleurites montana caused by Mycosphaerella websteri sp. nov.**—*Mycol. Pap. Commonw. Mycol. Inst.* 55, 4 pp., 1 pl., 1 fig., 1953. 2*s.* 6*d.*

A leaf spot epidemic on tung (*Aleurites montana*) seedlings in Nyasaland was found to be caused by a new species of *Mycosphaerella* [*R.A.M.*, 32, p. 670] for which the name *M. websteri* is proposed. The spots are circular and brown, with a grey centre and faint yellow halo, in humid weather becoming confluent and zoned with a broad, watersoaked margin. They later become necrotic and the leaves are shredded by the wind, severe defoliation often occurring. The perithecia of *M. websteri* are subepidermal, globose, dark brown, and 50 to 130 μ in diameter, with a circular ostiole surrounded by papillae up to 4 μ long. The asci are oblong to clavate, 30 to 55 by 9 to 15 μ, and the ascospores fusiform, uniseptate, hyaline, and 10 to 16 by 4 to 6 μ. The *Cercospora* conidia are 25 to 160 by 2 to 6 μ. Both spore types occur together on the leaf lesions and their connexion has been proved experimentally.

DENNIS (R. W. G.). **Chloroscypha Seaver in Britain.**—*Kew Bull., 1954*, 3, p. 410, 1954.

A brief note is given on the occurrence of *Chloroscypha sabinae* n.comb. (syn. *Peziza sabinae* and *C. juniperina*) on dead leaves of *Juniperus communis* in Surrey during 1954. *C. seaveri* was found on *Cupressus lawsoniana* in Scotland in 1932.

MEYER (H.). **Zur Blasenrost-Resistenzzüchtung mit Pinus strobus.** [On the breeding of *Pinus strobus* for resistance to blister rust.]—*Z. Forstgenet.*, 3, 5, pp. 101–104, 4 figs., 1 diag., 1954. [English summary.]

At the Institute for Forest Botany, Hann.–Münden, Germany, 32 apparently healthy white pine (*Pinus strobus*) trees over 40 years old were selected in 1950–1 for breeding against *Cronartium ribicola* [*R.A.M.*, 32, p. 526]. In 1954 four clones of the vegetative progeny were found to be infected and in a further two the presence of the rust was suspected. To compensate for such losses, therefore, the initial material should not be too meagre. A 17-year-old hybrid between *P. strobus* and the Asiatic *P. griffithii*, which according to Bagchee [31, p. 410] is not absolutely immune in its native habitat, has entirely withstood artificial infection by *C. ribicola* at Hann.–Münden and is being back-crossed with *P. strobus* for further resistance tests.

SWAN (H. S. D.). **New Balsam Fir disease. A note on a disease which is causing widespread Balsam Fir (Abies balsamea) mortality in Eastern Canada.**—*Pulp Pap. (Mag.) Can.*, 55, 13, p. 249, 2 figs., 1954.

First observed in Quebec in April, 1954, and later in Ontario, a destructive disease of *Abies balsamea* is believed to be widespread in the eastern provinces of Canada. The leaders of apparently healthy trees turn a bright reddish-brown, the discoloration usually spreading fairly rapidly until all the foliage is involved. Desiccation soon ensues and is shortly followed by the death of the tree. Pencil-like dots, apparently representing the aecidial state of a rust, occur on the under sides of the affected leaves, and hyphae were found to have infiltrated and ramified throughout the cellular tissue. The relation of the fungus to the etiology of the disease has not yet been elucidated.

CARLO (L.). **Les procédés utilisés jusqu'à ce jour pour l'imprégnation des poteaux en bois et les expériences faites avec ces procédés.** [The processes utilized up to the present day for the impregnation of wooden poles and the experiments performed with these processes.]—*Z. schweiz. elektrotech. Ver.*, 44. 2, pp. 43–48, 1953.

This is a useful summary of the history, principles, and application of the various processes of timber preservation employed in Switzerland [see next abstract] and other European countries for the treatment of telegraph poles against [unspecified] lignicolous fungi and other injurious biological agencies.

CARLO (L.). **Expériences faites avec les poteaux en bois imprégnés sur le réseau du Service de l'électricité de Genève.** [Experiments performed with impregnated wooden poles on the network of the Electricity Service of Geneva.]—*Z. schweiz. elektrotech. Ver.*, 44. 2. pp. 48–53. 5 figs., 6 graphs. 1953.

The methods employed by the Geneva Electricity Service of preservation of telegraph poles against [unspecified] wood-destroying fungi [see preceding abstract] comprise wrappings with Wolman salts [*R.A.M.*, 29. p. 444 *et passim*], which were discontinued because of toxicity to cattle: swabbing the base with antiseptics and disinfection of the soil with basilite [34. p. 500] and carbolineum; re-impregnation by the Cobra process [6. p. 764]: immersion of the base overnight in a bath of creosote heated to 100° C.; and double-impregnation, consisting of the injection by the Boucherie process of a basilite solution into poles already treated with copper sulphate by the same procedure [34. p. 417]. Though superior to the simple Boucherie process, double-impregnation does not confer absolute protection.

RENNERFELT (E.). **Prüfung der pilzwidrigen Wirksamkeit von Holzschutzmitteln mit verschiedenen Laboratoriumsverfahren.** [Testing the fungicidal effect of wood preservatives by various laboratory techniques.]—*Holz a. Roh- u. Werkst.*, 12. 8. pp. 304–306. 1954. [Received 1955.]

The Swedish Wood Protection Committee made some comparative tests, using the agar test tube technique and the block method according to both the German Standard specification (DIN) and the American soil method [*R.A.M.*, 32. p. 159; 34. pp. 333, 334], to find a substitute for Boliden salt, which leaves a sediment of alkaline salts on the surface and gives rise to a certain danger of corrosion and electrical conductivity. The active components are in the form of oxides and are combined with copper as a fungicide.

Of the six coal tar oils tested by the three methods, oil no. II was least and oil no. IV most toxic to fungi: toxicity increased partly with the phenol content. Of the test fungi, *Lentinus lepideus* [33. p. 697] was the most resistant, then, in descending order, *Poria vaporaria* [32. p. 655], *Trametes serialis* [26. p. 369], and, very vulnerable, *Coniophora puteana*. Of the newer salts, K 33 and S 25 were more toxic than Boliden but less so than Wolman salts [see preceding abstract]. *L. lepideus* and *P. vaporaria* tolerated considerably higher concentrations than *C. puteana*.

In the soil-block method the American technique required larger quantities of coal tar oil than the German standard method to obtain inhibition, while salts showed no significant difference. Weight losses of unimpregnated wood were considerably higher in the first-named.

BIENFAIT (J. L.) & HOF (T.). **Feldversuche mit verschiedenen Holzschutzmitteln im Holzinstitut T.N.O., Delft, Niederlande.** [Field tests with various wood preservatives at the Timber Institute T.N.O., Delft, Netherlands.]—*Holz a. Roh- u. Werkst.*, 12. 8. pp. 306–308. 2 figs., 1954. [Received 1955.]

At the Timber Institute T.N.O. at Delft ten wood preservatives were applied by brushing, pressure, or the tank method to six types of timber. At the end of 1947

some of the treated posts were sunk in soil at The Hague, some into a small pond near by; others were used in a canal in the north-east Polder as a bank protection in April, 1948.

A few provisional results concerning the posts in soil were available after six years. Of the untreated posts larch, Sitka spruce, and Douglas fir [*Pseudotsuga taxifolia*] lasted longest; of 30 pine posts only four remained; poplar and willow [*Salix*] fell within 3 to $3\frac{1}{2}$ years. For the coniferous woods tar oil and pentachlorophenol were the best; mercuric chloride, Boliden salt, and celcure were generally satisfactory. With pine wood tanalith, copper sulphate, and zinc chloride also gave good results.

Tar oil and pentachlorophenol gave the best results with poplar; the protective effect of the water-soluble products was small, mercuric chloride giving the best results, followed by Boliden salt and zinc chloride. On *Salix*, Boliden salt was fairly effective and more readily absorbed than tanalith.

Of the posts sunk in water the general impression so far is good, only a few Sitka posts in the canal showing decay.

Lang (K. F.). **Grossversuche des Westeuropäischen Instituts für Holzimprägnierung.** [Large-scale experiments at the Western European Institute for Timber Impregnation.]—*Holz a. Roh- u. Werkst.*, 12, 8, pp. 308–312, 4 graphs, 1954. [Received 1955.]

The Western European Institute for Timber Impregnation, at The Hague, Holland, with representatives of 12 western European countries for international co-operation in scientific timber preservation, has drawn up a large-scale working programme. Railway sleepers and poles are to be tested, under conditions similar to those usual in practice, in southern France, western Germany, and southern Sweden. Six different impregnating oils from Germany, England, Scotland, and France have been selected. The test pieces will be examined at yearly intervals during the first five years, and every five years afterwards. Electrical transmission poles will, in addition, be impregnated with four salt mixtures.

Buro (A.). **Die Wirkung von Hitzebehandlungen auf die Pilzresistenz von Kiefern- und Buchenholz.** [The effect of heat treatment on the resistance to fungi of Pine and Beech wood.]—*Holz a. Roh- u. Werkst.*, 12, 8, pp. 297–304, 3 graphs, 1954. [Received 1955.]

In tests at the Federal Institute, Berlin-Dahlem, stain-free pine and undeformed beech wood blocks, 50 by 30 by 5 mm., subjected to dry heat in air and nitrogen at temperatures of 125°, 150°, 175°, and 200° C., each for four hours, and at 250° for one hour, were completely overgrown by the test fungi, *Coniophora cerebella* [*C. puteana*: *R.A.M.*, 33, p. 126] and *Lentinus lepideus* [33, p. 697] for pine, and *C. puteana* and *Polystictus versicolor* [33, p. 392] for beech. The heating caused light discoloration up to 175°; at 200° beech wood became black, and pine black-brown, accompanied by deformation and loss of weight.

It is concluded that the threshold of protective heat treatment lies above a weight loss of 8 to 10 per cent., at which point the wood is so deteriorated that this treatment is of little use.

Bellmann (H.). **Praxisnahe Laboratoriums-Untersuchungen über das Eindringen von Flüssigkeiten in Holz bei der Kesseldrucktränkung.** [Laboratory investigations, under conditions near to practice, on the penetration of liquids into timber by the tank pressure impregnation method.]—*Holz a. Roh- u. Werkst.*, 12, 8, pp. 312–316, 3 figs., 7 graphs, 1954. [Received 1955.]

By means of a new experimental plant permitting the reproduction of large-scale commercial methods, particularly vacuum-pressure, various influences on

impregnation were investigated at the Federal Institute for Forestry and Timber [near Hamburg] from 1950 to 1954 [cf. *R.A.M.*, 34, p. 198]. This plant permits pressures up to 30 kg. per sq. cm. and temperatures up to 230° C., though temperatures over 130° are impracticable, as they are likely to entail carbonisation.

Penetration into non-blue pine wood was poor at wood humidities over 40 per cent. but rapidly improved as humidity was reduced to 20 to 25 per cent.; further decreases exerted no practically significant influence.

A recent opinion that better impregnation of spruce can be achieved with humidities a little above fibre-saturation point than with dry wood could not be confirmed for pine. Blue stain [unspecified] pine wood must be dried more thoroughly than unstained wood, the optimum impregnation conditions being at humidities of 20 to 22 per cent., when penetrations are noticeably deeper than in unblued.

Mathematical relations can be established between steeping pressure, time, and the temperature of the preservative. From these, formulae can be derived which explain contradictions in earlier publications, if the arrangements of the experiment, the air content, and state of maturity of the wood are taken into consideration. Graphs relating depth of penetration to temperature are given, from which, provided steeping pressure, time, and temperature are known, the expected penetration depth can be read. These mathematical relations need to be checked with commercial practice.

GADD (G. O.) & WARTIOVAARA (V.). **On the chemical reaction causing rot stains in wet pulp and in wood.**—*Paperi ja Puu*, 36, 7, pp. 291–295, 2 figs., 1954.

At the Research Institute of the Finnish Pulp and Paper Industries, Helsinki, a study was made of the chemical reactions leading to the production of coloured stains in wet mechanical pulp by the lignicolous fungi causing corrosion rots. Solutions in which *Polyporus* [*Polystictus*] *abietinus*, *Fomes annosus*, and *Stereum sanguinolentum* had been cultured were found to contain an enzyme, probably laccase [*R.A.M.*, 34, p. 118], which oxidized polyphenols to brown dyes. It seems probable that the stains in question represent a special case of a chemical reaction common in wood, involving the conversion of phlobotannins to phlobaphenes. In experiments to determine the oxygen requirements of *P. abietinus*, *S. sanguinolentum*, *Lenzites sepiaria*, *Coniophora cerebella* [*C. puteana*], and *Lentinus lepideus*, none of the species grew at a partial oxygen pressure of 0 mm. mercury, all but the last-named made slight growth at 8, and all developed fairly well at 16, causing dark stains.

Of various chemicals tested *in vitro* for the control of the defect, only sodium azide proved efficient, inactivating the enzyme at a concentration of 50 p.p.m. In small-scale experiments on bales of mechanical pulp very good results were obtained in the elimination of rots and moulds (*Penicillium*, *Aspergillus*, *Alternaria*, *Paecilomyces*, *Trichoderma*, *Cephalosporium*, *Stemphylium*, *Pullularia*, *Phoma*, *Mucor*, *Cadophora*, *Lecythophora* [*Phialophora*], *Haplographium*, *Hormodendrum*, *Ophiostoma*, *Oidiodendron*, and *Rhinocladiella* spp.) [32, p. 290] by the same compound at a strength of 200 gm. per wet ton, but its toxic properties complicate its technical use.

WÜNSCHE (M.). **Schwamm im Haus. Vorbeugung und sichere Bekämpfung.** [Dry rot in the house. Prevention and reliable control.]—180 pp., 21 figs., Berlin, Druckhaus Tempelhof, 1952. [Abs. in *For. Abstr.*, 16, 2, p. 284, 1955.]

This book contains sections on the biology and identification of the fungi involved [*R.A.M.*, 34, p. 420], determination of the age of dry rot [33, p. 513], danger of infection, appraisal of damage, chemical preservation of timber and masonry, preventive measures, control of dry rot and other fungi, and legal questions.

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